PRELIMINARY ENGINEERING REPORT

S.R. 401 Bridge Replacement PD&E Study

Project Development and Environment (PD&E) Study

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by FHWA and FDOT.

PRELIMINARY ENGINEERING REPORT

S.R. 401 Bridge Replacement PD&E Study

Project Development and Environment (PD&E) Study

Project Limits: Approximately 500’ south of the S.R. 528 Bridges to 3,500’ north of the S.R. 401 bridges to Charles M. Rowland Dr.

Brevard County, Florida

Financial Project Identification (FPID) Number: 444787-1-22-01

ETDM Number: 14397

Prepared For:

Florida Department of Transportation

February 2023
Revised March 2024
Revised May 2024

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by FHWA and FDOT.

PROFESSIONAL ENGINEER CERTIFICATION

PRELIMINARY ENGINEERING REPORT

Project:	S.R. 401 Bridge Replacement PD&E Study
ETDM Number:	14397
Financial Project ID:	444787-1-22-01
Federal Aid Project Number:	N/A

This preliminary engineering report contains engineering information that fulfills the purpose and need for the S.R 401 Project Development & Environment Study from approximately 500 feet south of the S.R. 528 bridges to 3,500 feet north of the S.R. 401 bridges to Charles Rowland Dr., in Brevard 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.

I, Gary L. Donn, P.E., hereby certify that I am a registered professional engineer in the State of Florida, practicing with Parsons Transportation Group Inc., and that I have prepared or approved the evaluation, findings, opinions, conclusions, or technical advice hereby reported for:

This document has been digitally signed and sealed by:

Engineer of Record:

Gary L. Donn, PE

Digitally signed by Gary L. Donn, PE
DN: cn=Gary L. Donn, PE, o=Parsons Transportation Group, Inc., ou, email=gary.donn@parsons.com, c=US
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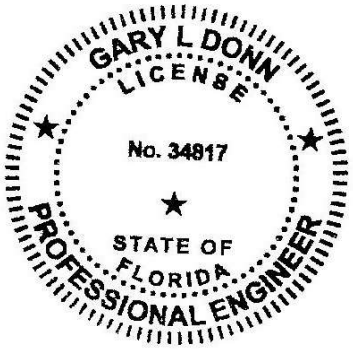

Gary L. Donn, P.E.
P.E. License No. 34817
7600 Corporate Center Drive,
Suite 104
Miami, FL 33126

The official record of this document has been electronically signed and sealed using Digital Signature as required by 61G15-23.004 F.A.C. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

May 2024

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LIST OF ACRONYMS

AADT	Annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
APE	Area of potential effect
BT	Buried telephone
CAC	Community Advisory Committee
C3C	Suburban Commercial Context Classification
CAGR	Compound annual growth rates
CATV	Cable television
CCTV	Closed-circuit cable television
CEI	Construction Engineering & Inspection
CFR	Code of Federal Regulations
CL	Centerline
CMF	Crash Modification Factor
CRAS	Cultural Resources Assessment Survey
CS	(Bridge) Condition State
CSER	Contamination Screening Evaluation Report
DMS	Dynamic Messaging System
DOE	degree of effect
D5	District Five (FDOT)
EB	eastbound
EFH	Essential Fish Habitat
EMO	Environmental Management Office
ERP	Environmental Resource Permit
ESA	Endangered Species Act
EST	Environmental Screening Tool
ETDM	Efficient Transportation Decision-Making
FAA	Federal Aviation Administration
FDACS	Florida Department of Agriculture and Consumer Services
FDM	Florida Design Manual
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FE	Federal Endangered listing status
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FP&L	Florida Power & Light
FWC	Florida Fish and Wildlife Conservation Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Registration Map
FLUCCS	Florida Land Use, Cover and Forms Classification
FP&L	Florida Power & Light
FT	Federal Threatened listing status
HAPC	Habitat Area of Particular Concern
HCS	Highway Capacity Software
HCM	Highway Capacity Manual
ICWW	Intracoastal Waterway

IRL	Indian River Lagoon
ITS	Intelligent Transportation System
LOS	Level of Service
LRE	Long Range Estimate
LRTP	Long Range Transportation Plan
MBTA	Migratory Bird Treaty Act
MD	midday
MLOU	Methodology Letter of Understanding
MOE	Measure of effectiveness
mph	miles per hour
MSE	mechanically stabilized earth
NASA	National Aeronautics and Space Administration
NAVD	North American Vertical Datum
NB	northbound
NBI	National Bridge Inventory
NHS	National Highway System
NMFS	National Marine Fisheries Service
NOTU	Naval Ordinance Testing Unit
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OFW	Outstanding Florida Water
OSW	Other Surface Waters
PD&E	Project Development & Environment
PE	Professional Engineer
PER	Preliminary Engineering Report
PSEE	Project Suite Enterprise Edition
PTAR	Project Traffic Analysis Report
PTMS	Portable Traffic Monitoring Site
SB	Southbound
SCE	Sociocultural Effects Evaluation
SHPO	State Historic Preservation Office
SIS	Strategic Intermodal System
SJRWMD	St. Johns River Water Management District
SHS	State Highway System
S.R.	State Road
STRAHNET	State Strategic Highway Network
TAC	Technical Advisory Committee
TNM	Traffic Noise Model
TPO	Transportation Planning Organization
UAO	Utility Agency/Owner
USC	U.S. Code
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
v/c	volume to capacity ratio
VE	value engineering
WB	westbound
WBID	Waterbody Identification Number

1. PROJECT SUMMARY

1.1 Project Description

The Florida Department of Transportation (FDOT), District Five, is conducting a Project Development and Environment (PD&E) Study to evaluate replacement alternatives for the three existing bascule bridges over the Canaveral Barge Canal at Port Canaveral in Brevard County, Florida. As shown in the Project Location Map (Figure 1-1), the study area project limits are approximately 500 feet south of the S.R. 528 bridges to 3,500 feet north of the

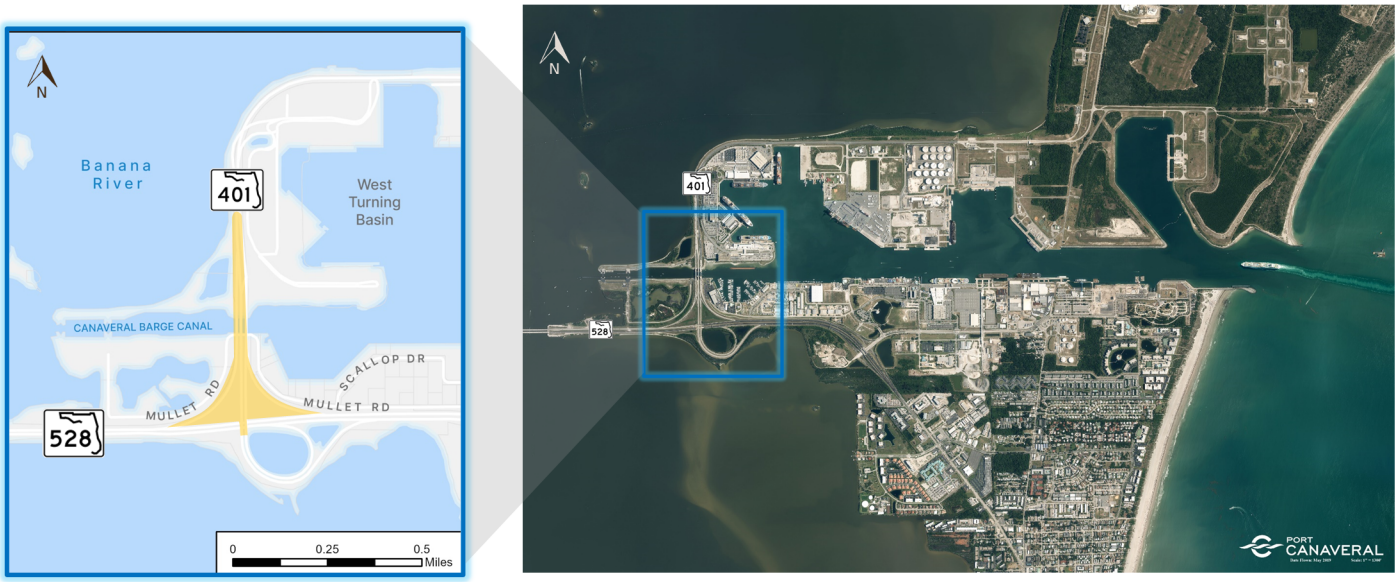


Figure 1-1: Project Location Map

S.R. 401 bridges to Charles Rowland Dr. The S.R. 401 bridges over the Canaveral Barge Canal provide a vital connection to Port Canaveral's operations including major cruise and cargo terminals. The bridges also serve as the primary access to Cape Canaveral Air Force Station, Naval Ordinance Test Unit, facilities for the U.S. Coast Guard, and access to Space Florida operations.

Within the study limits, S.R. 401 is functionally classified as an Urban Minor Arterial (Functional Classification 16). Currently there are no pedestrian and bicycle accommodations on the bridges. S.R. 401 has a context classification of C3C-Suburban Commercial. As defined by the FDOT Context Classification Guidebook, corridors with a C3C context classification are typically commercial featuring "mostly non-residential land uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network". The access management classification for S.R. 401, within the study area, is Access Classification 4, Non-Restrictive.

The existing 354-foot single-leaf bascule bridges consist of three separate structures accommodating southbound and northbound traffic with three travel lanes in each direction:

Bridge No. 700030 (southbound), constructed in 1963

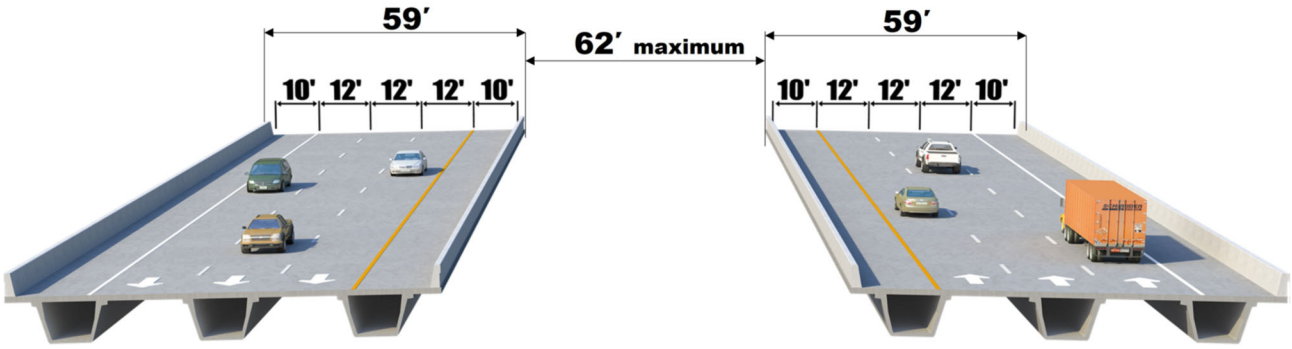
Bridge No. 700031 (southbound), constructed in 1963

Bridge No. 700117 (northbound), constructed in 1972.

Description of the Preferred Alternative

The preferred alternative consists of two High-Level Fixed Bridges replacing the existing three bascule bridges with two separate three-lane high-level, fixed span concrete bridges located on the existing bridge alignment. This improvement would provide a maximum 65-foot vertical clearance above mean high water and a 90-foot horizontal clearance at the main navigational channel. There are two bridges, each of which is 1,065.5 feet in length, for a total bridge length of 3,211 feet. The maximum grade is 6% and design speed is 45 mph.

The typical sections for the proposed S.R. 401 bridges, shown below, will feature three 12-foot-wide travel lanes and 10- foot-wide inside and outside shoulders on each bridge. The Preferred Alternative Typical Section Package is included as an attachment. Since S.R. 401 is a limited access facility at this location, there are no provisions for bike lanes nor sidewalks. The width of each bridge will be 59 feet, and there will be a 62-foot maximum separation between the bridges.



1.2 Purpose and Need

The purpose of the project is to evaluate improvements to, or replacement, of the existing bascules bridges over the Canaveral Barge Canal. The primary need for the project is based on system linkage, and modal interrelationships.

Project Status

The S.R. 401 Bridge over the Canaveral Barge Canal is within the jurisdiction of the Space Coast Transportation Planning Organization (TPO). The 444787-1 S.R. 401 Bridge PD&E

study is listed in the September 2022 Amendment of the Regionally Significant Cost Feasible Plan within the 2045 Long Range Transportation Plan (LRTP). The S.R. 401 Bridge project was identified in the LRTP as "one of the major projects on the Strategic Intermodal System that extend beyond the timeframe of the TIP that will be implemented with reasonably anticipated revenue."

1.2.1 System Linkage

S.R. 401 is part of the State Highway System (SHS) and the National Highway System (NHS) and is designated a Strategic Intermodal System (SIS) as a connector, providing access to Cape Canaveral, a SIS Seaport. Port Canaveral's operations include major cruise terminals, cargo terminals, and substantial tanker truck traffic.

Additionally, S.R. 401 is classified as a part of the State Strategic Highway Network (STRAHNET) connector by the Military Surface Deployment and Distribution Command as a connection to an ocean terminal to deploy and sustain U.S. forces on a global basis. The two southbound bridges (700030 and 700031) were constructed in 1963 and the northbound bridge (700117) was constructed in 1972. The bridges are the primary access to Cape Canaveral Space Force Station and Space Florida operations, Naval Ordinance Test Unit (NOTU), facilities for the U.S. Coast Guard, and access to Space Florida operations. The 2011 Spaceport Area Transportation Infrastructure Assessment by the Space Coast Transportation Planning Organization (TPO) identified the weight limit as an impediment to expanding port freight operations and maximizing military uses.

1.2.2 Modal Interrelationships

The 2019-2020 Port Directory shows that Port Canaveral accommodated approximately 4.5 million passengers and approximately 6,400,000 tons of overall cargo in 2018, in addition to outdoor recreation such as fishing and boating. The S.R. 401 bridges provide access to/from Port Canaveral. As the second largest cruise port in the world today, *Port Canaveral's 30-year Strategic Vision Plan* identifies the Port's successful growth as rooted in the link between Central Florida theme parks and the cruise industry.

The 2017, *FDOT S.R. 401 Bridge Alternatives Analysis Study* showed 14,900 annual average daily traffic (AADT) with 13% truck traffic. The truck traffic includes fuel transport, which accounts for about 40% of the supply for Central Florida. While the Port Canaveral *30-Year Strategic Vison Plan* notes that petroleum cargo may level off as the U.S. transitions to more renewable energy sources, overall cargo is expected to grow to more than three times the current tonnage by 2048. The primary transportation options to distribute cargo is via truck or barge. Minimizing delays for the road and vessel usage will better position Port Canaveral to provide economic growth. The S.R. 401 bridges opening to marine vessels create traffic delays to the port and cruise terminal. Similarly, marine vessels are delayed based on operation restrictions. Traffic evaluations and a vessel survey has been completed

that determined factors to reducing delays. Finally, Port Canaveral's *Vision Plan* considers the sector north of the S.R. 401 bridges as having more demand for growth than land available, which further adds to the importance of this distribution connectivity. For updated traffic information, see Section 4.3 – Future Traffic Analysis of Alternatives.

1.3 Commitments

Project commitments will be documented following FDOT's Procedure No. 650-000-003, Project Commitment Tracking and included in the Project Suite Enterprise Edition (PSEE) Commitment Module.

As of the publication of this document, anticipated project commitments are:

- The USFWS and FWC Standard Manatee Construction Conditions for In-Water Work will be utilized during construction.
- The NMFS Protected Species Construction Conditions, NOAA Fisheries Southeast Regional Office will be utilized during construction.
- The NFMS Vessel Strike Avoidance Measures, NOAA Fisheries Southeast Regional Office will be utilized during construction.
- NMFS Vibratory Pile Driving Report Calculator for noise impacts during construction will be completed during the design and permitting phase.
- Coordination with NMFS will continue and consultation with NMFS will occur during the design/ permitting phase.

1.4 Alternatives Analysis Summary

The following Alternatives were analyzed during the PD&E Study:

1. The No Build Alternative consists of leaving the existing bascule bridges in place.
2. The Fixed Bridge Alternative would replace the existing three bascule bridges with two separate three-lane, high-level, fixed span concrete bridges.
3. The Lift Bridge Alternative would replace the existing three bascule bridges with two separate three-lane lift bridges.
4. The Bascule Bridge Alternative would replace the existing three bascule bridges with two separate three-lane bascule bridges,

Please see Section 4 for additional information.

1.5 Description of the Preferred Alternative

Based on the results of the technical analysis, public and agency input to date, (including the PD&E Study Public Information Meeting held in February 2022), the High-Level Fixed Alternative was chosen as the preferred alternative. The High-Level Fixed Bridge Alternative considers replacing the existing three bascule bridges with two separate three-lane high-level, fixed span concrete bridges located on the existing bridge alignment. This improvement would provide a maximum 65-foot vertical clearance above mean high water and a 90-foot horizontal clearance at the main navigational channel. The total bridge length would be 3,210 feet. The maximum grade of 6% and design speed of 45 mph would require a design variation. The following is a description of the preferred alternative:

Northbound

- Three 12-foot-wide travel lanes
- 10-foot-wide inside and outside shoulders
- No provisions for sidewalks or bike lanes

Southbound

- Three 12-foot-wide travel lanes
- 10-foot-wide inside and outside shoulders
- No provisions for sidewalks or bike lanes

The overall out-to-out width of the northbound bridge will be 59-foot, 0-inches and the southbound bridge will be 59-foot, 0-inches. There will be a 62-foot, 0-inch maximum separation between both bridges.

The Concept Design Plans for the Preferred Alternative will be provided in **Appendix A.**

1.6 List of Technical Documents

Companion reports and documentation published for this Preliminary Engineering Report are listed below. Each contains detailed information regarding its respective component of the engineering or environmental analysis.

1.6.1 Previous Planning Studies

- S.R. 401 Bridge Alternatives Evaluation, March 2017

1.6.2 Traffic

- Traffic Analysis Methodology Technical Memorandum, January 2022
- Project Traffic Analysis Report (PTAR), April 2022

1.6.3 Engineering

- Preliminary Engineering Report (PER)
- Typical Section Package

- Existing Conditions Memorandum (August 2022)
- Risk Assessment Memorandum (August 2022)
- Bridge Hydraulic Memorandum (May 2022)
- Location Hydraulics Report (September 2022)
- Pond Siting Report (September 2022)
- Preliminary Geotechnical Report, March 2022
- Value Engineering Report, May 2022
- Concept of Operations
- Quality Control Plan, May 2021

1.6.4 Environmental Reports

- Contamination Screening Evaluation Report Level 1 (CSER), January 2022
- Marine Vessel Survey and Navigation Study, October 2021, revised April 8, 2022
- Water Quality Impact Evaluation
- Natural Resources Evaluation
- Cultural Resources Assessment Survey (CRAS), January 2022
- Utilities Assessment Package, March 2023

1.6.5 Public Involvement

- Public Involvement Plan, June 2021
- Public Meeting Summary Memorandum, March 2022
- Public Hearing Transcript, February 2023
- Public Hearing Summary Memorandum, March 2023
- Meeting Documentation (Agendas, Exhibits, and Notes)

2. EXISTING CONDITIONS

2.1 ROADWAY

2.1.1 Functional and Context Classification

Within the study limits, S.R. 401 is classified as an Urban Minor Arterial (Functional Classification 16). It has a context classification of C3C–Suburban Commercial. As defined by the FDOT *Context Classification Guidebook*, corridors with a C3C context classification are typically commercial featuring "mostly non-residential land uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network".

2.1.2 Access Management

The FDOT access management classification for S.R. 401, within the study area is Access Classification 03, Non-Restrictive.

2.1.3 Typical Sections

The existing bridges provide a total of six travel lanes, three in each direction (see figure 2-1). Bridge No. 700030 (southbound) is single lane bridge that connects S.R. 401 southbound with S.R. 528 westbound traffic. Bridge No. 700031 (southbound) has two lanes that connect S.R. 401 southbound to S.R. 528 eastbound, and Bridge No. 700117 (northbound) provides three travel lanes combining eastbound and westbound traffic from S.R. 528 into S.R. 401.

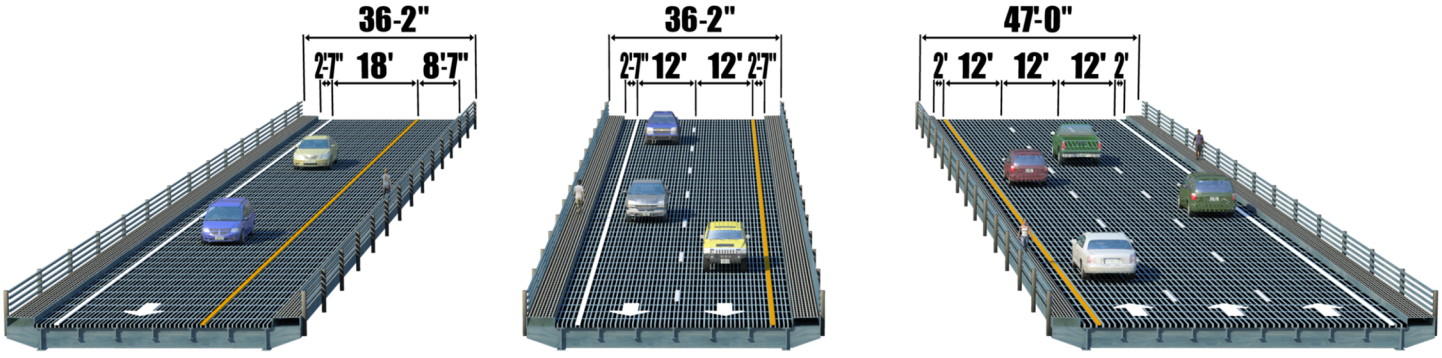


Figure 2-1: Typical Section for Existing S.R. 401 Bridges

The existing bridges provide a 90-foot-wide navigational horizontal clearance and a 25-foot navigational vertical clearance above mean high water level of the Canaveral Barge Canal when the bridges are in the closed position. There are no existing sidewalks or bicycle lanes on S.R. 401 or the bridges.

2.1.4 Design and Posted Speed

The current posted speed on S.R. 401 within the project limits is 50 miles-per-hour (mph).

2.1.5 Right-of-Way

The project limits begin approximately 500 feet south of the S.R. 528 bridges over S.R. 401 and continues approximately 3,500 feet north. All alternatives can be constructed within the existing limited access right of way line. FDOT's right-of-way is by easement with Port Canaveral.

2.1.6 Pavement Condition

Based on the latest Pavement Condition Survey, the existing pavement for the section south of the Canaveral Barge Canal is in fair condition with a cracking rating of 8.5 and a ride rating of 7.1. The existing pavement for the section north of the Canaveral Barge Canal is in good condition with a cracking rating of 10.0 (no prominent cracks) and a ride rating of 7.3.

2.1.7 Pedestrian, Bicycle, and Transit Facilities

There are neither sidewalks nor bike lanes currently existing on S.R. 401. Based on input from the Canaveral Port Authority Safety and Security Director, and the US Space Force, the future condition will remain without bicycle lanes and sidewalks to address specific safety concerns to limit bike/pedestrian activity in the area.

The parking lot located northeast of the S.R. 401 bridges is designated as a Rideshare Driver's waiting area on local maps. This parking lot is accessed via the Cruise Terminal entrance north of the northern project limits.

There are no public bus routes that run through the project corridor.

2.1.8 Horizontal and Vertical Geometry

The existing S.R. 401 horizontal geometry is comprised of three parallel alignments at a constant bearing of N 0° 20' 28.82" W over the Canaveral Barge Canal. The west and center alignments serve S.R. 401 southbound (SB) traffic, and the remaining east alignment serves S.R. 401 northbound (NB) traffic. Approximately 820 feet north of the canal, the southbound to westbound (WB) alignment remains constant. The southbound (SB) to eastbound (EB) alignment diverges using straight tapers resulting in parallel SB roads with a 48 ft of separation. At 1,370 ft north of the canal, NB S.R. 401 uses a left shift with reversed horizontal curves to eliminate the median spacing between NB and SB, creating an undivided S.R. 401. S.R. 401 interchange with the S.R. 528 south of the barge canal is a trumpet interchange configuration. Horizontal curves are present on the SB to WB (Ramp E) and WB to NB ramp (Ramp H). The connection radius for Ramp E is 6° 00' and 7° 00' for Ramp H. The required superelevation for Ramp E is 8.2 % and the existing superelevation is 8.7%. The existing vertical alignment has a partial crest (bascule bridge has flat alignment) along the canal section, entering grades of 2.6% and exiting grades of 2.5%. Roadway

grades outside of the canal crest are relatively flat. Areas outside the existing crest at the canal have a maximum grade of 0.2% to the north and 0.3% to the south. The maximum vertical grade for Ramp H is 3.2% and for Ramp E 2.9%.

2.1.9 Intersections and Signalization

There are no intersections or signalization throughout the project corridor.

2.1.10 Existing Traffic and Safety Analysis

An operational analysis was performed for existing conditions with the existing lane geometry and 2019 traffic. The acceptable FDOT Level of Service (LOS) Procedure on LOS targets for the study is 'LOS D'. The existing analysis showed that most of the study area roadways operate at an acceptable level of service during the morning (AM) and midday (MD) peak periods. The afternoon (PM) volumes were less than the MD that is why the analysis included the MD peak as provided in the Approved Forecast Memorandum. The existing roadway Freeway and ramp junction analyses showed that they operate at an acceptable level of service during the AM and MD peaks, See Tables 2-1 and 2-2.

Table 2-1: Existing Year AM/MD HCS Freeway & Ramp Summary

Location ID	Freeway			Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
1. S.R. 528 EB Freeway Segment from N Banana River Dr.to S.R. 401	2300/1600	24.3/16.6	C/B			
2. S.R. 528 EB off Loop Ramp to S.R. 401 NB	2300/1600			650/250	26.4/18.5	C/B
3. S.R. 528 EB on Ramp from S.R. 401 SB	1650/1350			1/200	19.3/15.6	B/B
4. S.R. 528 EB Freeway Segment from S.R. 401 to George King Blvd	1650/1550	19.9/15.4	C/B			
4. S.R. 528 WB Freeway Segment from George King Blvd to S.R. 401	1200/1200	12.1/11.9	B/B			
5. S.R. 528 WB off Ramp to S.R. 401 NB	1200/1200			350/200	3.3/3.0	A/A
9. S.R. 528 WB on Ramp from S.R. 401 SB	850/1000			150/200	12.3/13.4	B/B
1. S.R. 528 WB Freeway Segment from S.R. 401 to N Banana River Dr.	1000/1200	10.9/12.0	A/B			

Table 2-1: Existing Year AM/MD HCS Freeway & Ramp Summary

Location ID	Freeway			Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
6.1 & 6.2 NB off Ramp from S.R. 401 to Charles M. Rowland Dr NB	1000/450			60/120	0.9/0.0	A/A
7. SB on Ramp from Charles M. Rowland Dr to S.R. 401	100/300			50/100	1.6/3.8	A/A

Table 2-2: Existing Year AM/MD HCS Multilane Summary

Location ID	NB			SB		
	Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Volume (veh/hr)	Density (pc/mi/ln)	LOS
8. S.R. 401 from S.R. 528 to Charles M. Rowland Dr	1000/450	8.9/4.6	A/A	150/400	1.6/3.8	A/A
8. S.R. 401 from North of Charles M. Rowland Dr	940/330	12.9/5.3	B/A	100/300	1.8/4.4	A/A

Crash data for the five (5) year period from January 1, 2016, to December 31, 2020, was obtained from the Florida Department of Transportation's CARS database and the University of Florida's Signal Four Analytics for the 0.5-mile segment of S.R. 401 from approximately 950 feet north of S.R. 528 to the overpass for Charles M. Rowland Drive, Table 2-3 summarizes the information. Within the project segment, there were no high crash locations identified.

Table 2-3: Five Year Crash Summary

Crash Year		2016	2017	2018	2019	2020	Total	Percentage
Crash Type	Fixed Object	0	0	0	4	1	5	38.46%
	Object-in-Road	0	0	1	1	0	2	15.38%
	Off-Road	0	0	1	0	0	1	7.69%
	Rear-End	0	2	1	0	1	4	30.77%
	Sideswipe	0	1	0	0	0	1	7.69%
	Total	0	3	3	5	2	13	100.00%
Light Conditions	Daytime	0	3	1	4	2	10	76.92%
	Night	0	0	2	1	0	3	23.08%
	Total	0	3	3	5	2	13	100.00%
Surface Conditions	Dry Pavement	0	3	1	3	1	8	61.54%

Table 2-3: Five Year Crash Summary

Crash Year		2016	2017	2018	2019	2020	Total	Percentage
	Wet Pavement	0	0	2	2	1	5	38.45%
	Total	0	3	3	5	2	13	100.00%
Crash Severity	Property Damage Only	0	2	2	4	2	10	76.92%
	Sustained Injury	0	1	1	1	0	3	23.08%
	Fatality	0	0	0	0	0	0	0.00%
	Total	0	3	3	5	2	13	100.00%

2.2 Drainage

2.2.1 Existing Drainage Patterns

The bridges' midspans drain through grated decks directly into the Canaveral Barge Canal. The southernmost two spans and approaches of Bridge No. 700117 and Bridge No. 700030 drain to storm sewer inlets that discharge to the S.R. 528 ramp infield ponds. The southernmost two spans of Bridge No. 700031 drain down the slope pavement directly into the Canaveral Barge Canal. The northernmost two spans of Bridge No. 700031 drain down the slope pavement directly into the Canaveral Barge Canal. The northernmost two spans of bridges 700030 and 700117 drain to storm sewer inlets which discharge into roadside ditches.

The S.R. 401 roadways south of the bridges drain to the S.R. 528 ramp existing infield ponds. These infield ponds are connected to an existing pond in the loop ramp located in the southeast quadrant of the S.R. 528/S.R. 401 interchange. This pond connects to a smaller pond between the on-ramp and off-ramp which discharges to surface waters contiguous to the Banana River Lagoon. The ponds provide no stormwater treatment but serve to reduce freshwater discharges to the Banana River Lagoon.

North of the bridges a small section of the southbound lanes drains directly down the side slope to the Canaveral Barge Canal or to the Port Canaveral West Pond. Further north a shoulder gutter system collects runoff and delivers flow to the Port Canaveral interconnected pond system. This system consists of three ponds known as the West Pond, North Pond, and South Pond. The West Pond is located west of S.R. 401 and the others are located east of S.R. 401. They share a common weir elevation of 7.0 feet and treat the first flush of runoff. The other bridges and approaches drain north to storm sewer systems which deliver flow to a roadside ditch on the east side of S.R. 401 which drains south to the Canaveral Barge Canal. A minor amount of runoff from the S.R. 401 embankments sheet flows directly into the Banana River Lagoon (see figure 2-2 for existing drainage conditions map).

2.2.2 Receiving Waters

The primary receiving water bodies are the Canaveral Barge Canal and the Banana River Lagoon located south and north of S.R. 528. The Canaveral Barge Canal, which includes the Turning Basins (see figure 2-2), has a direct connection to the Atlantic Ocean. The Banana River Lagoon south of S.R. 528 is an Aquatic Preserve and an Outstanding Florida Water (OFW) and has waterbody identification number (WBID) 3057B. The Banana River Lagoon north of Canaveral Barge Canal and S.R. 528 causeway is WBID 3057C. The Banana River Lagoon waters are impaired for nutrients (phosphorus and nitrogen) with seagrass as a parameter of concern. The Banana River Lagoon is a “negative estuary”, characterized by low freshwater inflows and poor flushing resulting in long water residence time.

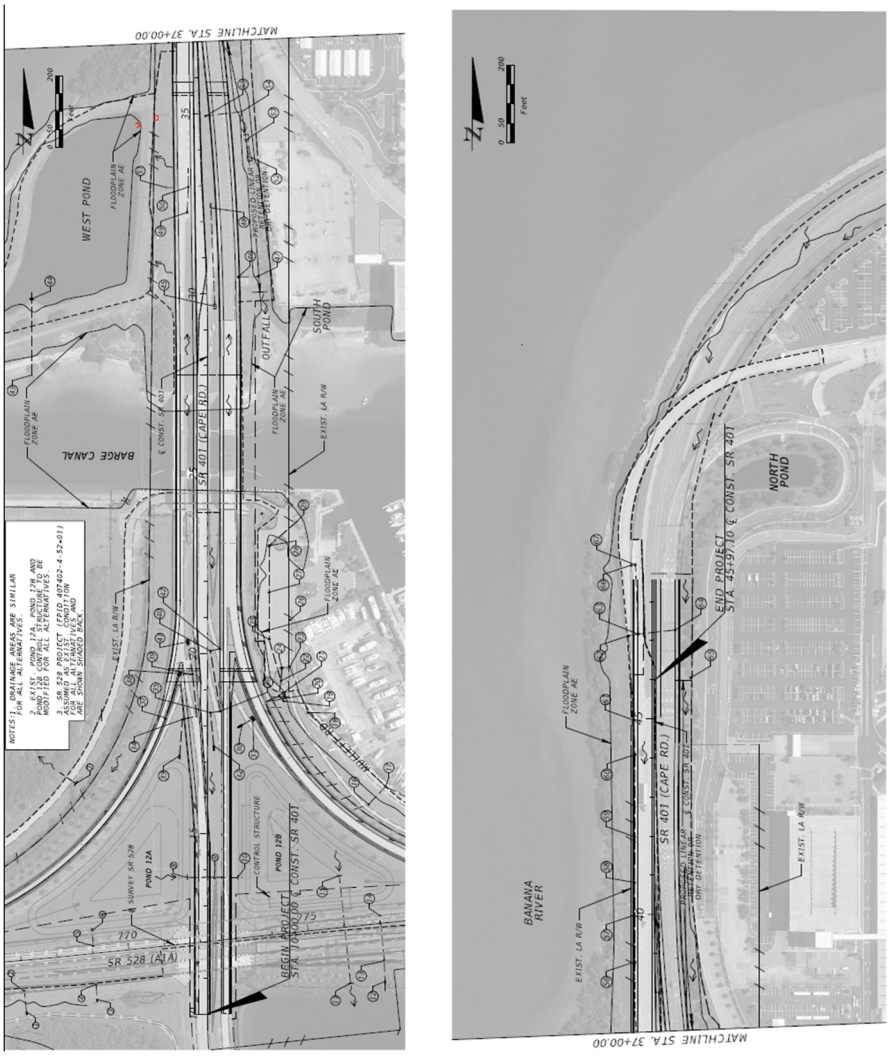


Figure 2-2: Existing Drainage

Figure 2-3: Port Canaveral Facilities Map

2.2.3 Existing Permits

Existing permits will need to be modified in areas where improvements are proposed. The following is a list of existing FDEP permits in the project area:

Permit No. 88466-1 New Barge Canal Bridges Rehabilitation

This permit was issued in 2003 for the FDOT District 5 to make improvements to the existing bridges. Temporary pavement used to shift traffic during construction was left in place for future use to aid maintenance. Stormwater treatment of the new pavement is provided through infiltration in the basins of the infield areas located south of the bridges. This permit may require a modification for the preferred alternative.

Permit No. 186093-5 Canaveral Port Authority West Pond

A wet detention pond was permitted to allow modifications to the existing ponds. This system consists of three ponds known as the West Pond, North Pond, and South Pond. The West Pond is located west of S.R. 401 and the others are located east of S.R. 401. They share a common weir elevation of seven feet and treat the first flush of runoff. It is likely this pond could be modified to satisfy treatment requirements for the project if cooperation can be garnered from the Canaveral Port Authority.

Permit No. 23918-1 Canaveral Port Authority

Located on northeast side of the project area at Charles M. Rowland Dr. this permit was issued in 1992 and was to add a new four-lane roadway alignment and removal of an existing four-lane roadway. The permit is within the project area and may require a modification depending on proposed improvements.

Permit No. 23919-1 WTB Navigation Relief, Grouper Road Realignment

Located on the south side of the bridges including the interchange with S.R. 528, this permit was issued in 1992 and was to add a new four-lane roadway alignment and removal of an existing four-lane roadway. Stormwater treatment is provided by use of retention in roadway ditches utilizing ditch blocks. This permit is most likely outside the project area.

Permit No. 16070-4 West Turning Basin Improvement Modification

Located to east of bridges and S.R. 401 and most likely outside of project area.

Permit No. 16328-1 Port Canaveral Master Drainage Plan

A master drainage plan was issued in 1988 for development of drainage systems throughout the port area. Most of the system has been implemented or revised.

Additionally, a U.S. Army Corps of Engineers (USACE) permit will be required for dredge and fill activity in wetlands or surface waters. The Banana River Lagoon is retained by the USACE for permitting.

2.2.4 Federal Emergency Management Agency (FEMA) Floodplains

The Canaveral Barge Canal has a 100-year flood elevation of 5.7 feet. In the Banana River the 100-year flood elevation is 2.7 feet (see Figure 2-4). Proposed improvements are unlikely to have impacts to any floodplains.

2.2.5 Tailwater and Sea Level Rise

Anticipated storm management facilities are recommended to be designed for existing tailwater conditions. Although sea level rise is assessed to determine the vulnerability of flooding over the design life of a project, the stormwater management facilities are recommended to be designed according to current tailwater conditions to ensure proper functionality. However, stormwater management facilities are recommended to be modified in the future as needed to address evident sea level rise. This approach results in a better functioning system until sea level rise occurs.

Linear dry detention ponds are recommended to be designed according to the seasonal high-water elevations determined by the team's Geotech analysis. Ponds 12A and 12B are recommended to be designed according to the existing tailwater conditions determined for the mitigation areas located in the southeast quadrant of the S.R. 528 and S.R. 401 interchange.

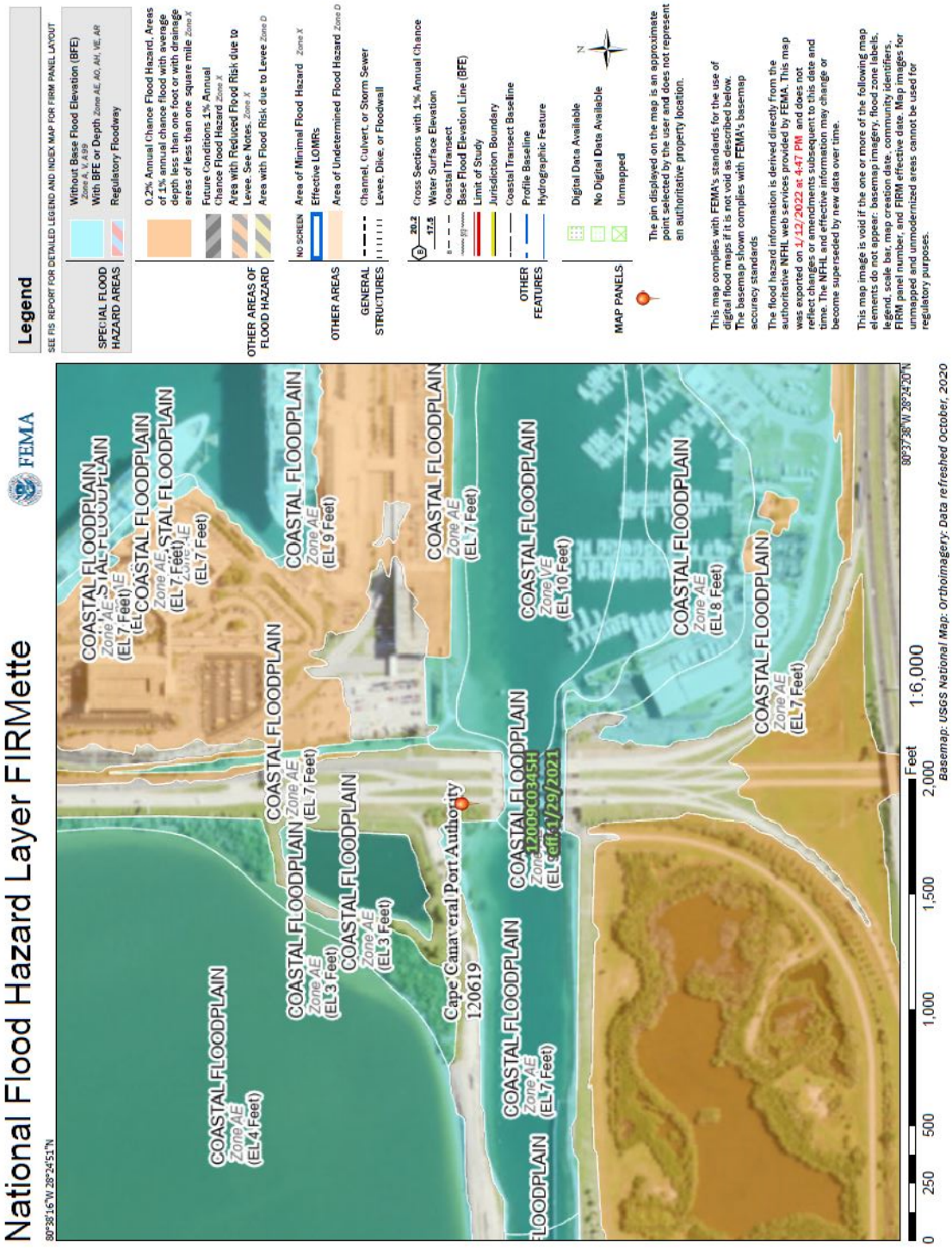


Figure 2-4: Floodplains Map

2.3 Utilities

Coordination with utility agencies/owners (UAOs) with facilities within the study limits and a Utilities Assessment Memorandum was developed in accordance with the FDOT PD&E Manual Part 2 Chapter 21: Utilities and Railroads.

Sunshine One-Call design tickets were issued, field reviews were conducted, and construction plans reviewed for the study areas of influence. UAOs with potential facilities within the study limits are listed in Table 2-4 below.

Table 2-4: Utility Agencies/Owners

Utility Agency/Owner	Utility Type	Contact
AT&T Distribution	Telephone/Fiber	Luke Folkerts
Charter Communications (Spectrum)	Cable Television (CATV)/Fiber	Paul Rymer
Crown Castle Fiber	Fiber	Walter Gruger
City of Cocoa, Florida	Water	Katherine Ennis
City of Cocoa Beach, Florida	Sewer	Brad Kaslow and Bob Majka
Florida Power & Light (FP&L) Transmission	Transmission Power	Beau Bentley
FP&L Distribution	Distribution Power	Adrienne James

The general locations of major utility facilities are described in Table 2-5 below.

Table 2-5: Existing and Planned Utilities

UAO	Utility Type and Size	Location
AT&T Florida	Telephone	Overhead Copper Telephone Line running east-west south of S.R. 528 A 1-4" PVC buried telephone (BT) Duct crossing S.R. 401 approx. 600 ft. south of the Canaveral Barge Canal. 2-4" PVC Duct running N/S along the east LA R/W to a BT Manhole (P-1) located 10 ft south of Mullet Road. A 600-PR 2" subaqueous copper BT crossing the Canaveral Barge Canal approx. 100 ft west of S.R. 401 to a BT Manhole (P-2) located approx. 350 ft north of the Canaveral Barge Canal adjacent to NB S.R. 401. 400-PR
Charter Communications/ Spectrum	CATV/Fiber	Per correspondence from Paul Rymer, Construction Specialist, Spectrum has no facilities within the study limits.
Crown Castle	Fiber Optic	No response. Crown Castle fiber optic lines may be located as underlines on the FP&L Distribution pole line.
City of Cocoa	Water	Water Main (WM) Location Maps received 9/27/21.

Table 2-5: Existing and Planned Utilities

UAO	Utility Type and Size	Location
		18" DI Subaqueous WM approx. 125 to 165 feet east of the S.R. 401 Bridges. South of the S.R. 401 Bridges, this WM is a 24" PSC that runs along the western edge of Mullet Road. At about 500 feet North of the bridges, the WM is 60-80 feet east of the S.R. 401 EOP. 6" AC WM (out of service) along western edge of the R/W for the S.R. 528 WB on ramp, crossing S.R. 401 approx. 250 feet south of Mullet Road and running along eastern edge of the S.R. 528 EB off ramp. 36" Conc WM along western edge of the R/W for the S.R. 528 WB on ramp (approx. 10-15 ft west of the 6" AC WM), crossing S.R. 401 approx. 675 feet south of Mullet Road and running along the western edge of Mullet Road.
City of Cocoa Beach	Sewer	No response. The City of Cocoa Sewer line appears to be run north-south about 60 feet east of the northbound S.R. 401 bridges.
Florida Power & Light	Transmission Power	Pole line with three high-voltage 69kV OE Transmission lines runs north-south just west of the LA R/W line within an easement (assumed). The Transmission lines cross S.R. 401 approximately 175 feet north of the S.R. 528 over pass.
	Distribution Power	Three 12.6kV OE Distribution underlines on the existing FP&L Transmission Pole Line within an easement (assumed). Approximately 650 feet north of the S.R. 401 Bridges, a service connection crosses the LA R/W. The OE distribution (under) lines cross S.R. 401 on Transmission poles approximately 175 feet north of the S.R. 528 overpass.

2.4 Railroads

There are no existing or planned rail facilities within the study limits.

2.5 Lighting

Without the presence of existing roadway lighting or underdeck lighting, there is no lighting type or maintaining agency to report. There are two light poles, one on either end of the bridge along S.R. 401. These two light poles, given their orientation, provide no bases for roadway lighting along S.R. 401, as this seems not to be their intent. These lights are likely for parking in the median for the tender house operator. The existing lights are conventional aluminum light poles with 150-watt high pressure sodium fixtures, which have a mounting height of about 35 feet. The power for these two light poles is likely tied to the bridge tender house. The existing bridges have navigational fender system lighting.

2.6 Signs

Table 2-6 lists existing roadside and overhead signs within the study limits.

Table 2-6: Existing Signs

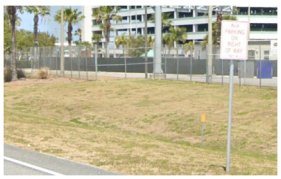
Sign	Type	Location	Photo
Drawbridge Ahead 600 feet	Single Post	Northbound S.R. 401 approx. 600 feet south of the S.R. 401 Bridge	
Wrong Way (2 signs)	Single Post	S.R. 401 Northbound – left and right sides, 575 feet south of the S.R. 401 Bridge	
Merge Arrow	Single Post	S.R. 528 WB Ramp to S.R. 401 Northbound	
Slippery Road (2 signs)	Single Post	S.R. .401 Northbound – left and right sides, south of the S.R. 401 Bridge	
Drawbridge Signal Stop Here on Red (2 Signs)	Overhead mounted	S.R. 401 Northbound – overhead, south of the S.R. 401 Bridge	
Adopt a Highway	Single Post	S.R. 401 Northbound – right side, north of the S.R. 401 Bridge	
Emergency Vehicles Crossing when Flashing (2 Signs)	Single Post with Flashing Light	S.R. 401 Northbound – left and right sides, north of the S.R. 401 Bridge	
AF Space Museum and History Center AHEAD 2 MILES	Multi-post	S.R. 401 Northbound – right side, 2-12 approx. 650 feet north of the S.R. 401 Bridge	
No Parking on the Right of Way	Single Post	S.R. 401 Northbound – right side, 2-12 approx. 600 feet north of the S.R. 401 Bridge	

Table 2-6: Existing Signs

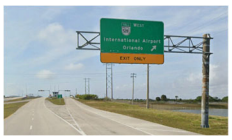
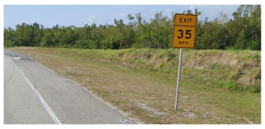
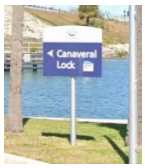
Sign	Type	Location	Photo
Terminals 5-6 Port Canaveral AHEAD & Terminals 8-10 Port Canaveral NEXT RIGHT	Overhead Signs on Dynamic Message System (DMS) sign structure	Northbound S.R. 401, 2-13 approx... 885 feet north of the S.R. 401 Bridge	
TOLL S.R.528 WEST International Airport Orlando EXIT ONLY	Cantilever	Southbound S.R. 401 – over right lane, 2-13 approx... 785 feet north of the S.R. 401 Bridge	
No U-Turn	Single Post	Southbound S.R. 401 – left side (median) north of the emergency crossing	
Exit	Single Post	Southbound S.R. 401 – gore area left of the exit	
Slippery Road (3 signs)	Single Post	Southbound S.R. 401 – right, center, and left sides	
Drawbridge Signal STOP Here on RED (2 signs)	Cantilever Single Post	S.R. 401 Southbound – just south of the S.R. 401 Bridge. Cantilever is on the left side of the Southbound Lane that is connecting to S.R. 528 Westbound. STOP Here signs are on either side of the Southbound lanes.	
Drawbridge Signal STOP Here on RED (2 signs)	Cantilever Single Post	S.R. 401 Southbound – just south of the S.R. 401 Bridge. Cantilever is on the right side of the two Southbound lanes that connect to S.R. 528 Eastbound. STOP Here signs are on either side of the Southbound Lane.	
No Fishing from Bridge	Single Post	S.R. 401 Southbound – right side	

Table 2-6: Existing Signs

Sign	Type	Location	Photo
Exit 35 mph	Single Post	S.R. 401 Southbound – right side, just south of the S.R. 528 Bridge	
Merge	Single Post	S.R. 401 Southbound to S.R. 528 WB Ramp	
Canaveral Lock	Single Post	Mullet Road, Southeast side of S.R. 401 Bridge	
Rodney S. Ketchum Park	Single Post	Mullet Road, about 165 feet east of the south bridge on-ramp	
Boat Ramp Trailer Parking	Single Post	Mullet Road, about 130 feet east of the south bridge on-ramp	
Reduced Speed Ahead	Single Post	Mullet Road, right behind the ramp and parking directional sign	

2.7 Intelligent Transportation Systems (ITS) Features

Existing ITS Facilities within the S.R. 401 corridor include a closed-circuit cable television (CCTV) at the interchange along with three DMS approaching the port parking area. There is also a gate system for the drawbridge and a static traffic monitoring station that uses loop detection, which indicates that the CCTV may have a wireless connection.

2.8 Aesthetic and Landscaping Features

The bridge aesthetic is purely functional and utilitarian. The existing landscape consists of sod and volunteer sabal palms(see figure 2-5).

Rodney S. Ketcham Park features a large parking area for boat trailers that utilize the boat ramp. The park consists of a restroom building along with a few shaded picnic tables and seating along with pedestrian access to the water and existing multi-use trail. Landscape treatments include sabal palms along with other salt tolerant accent trees, shrubs, and groundcover.

The S.R. 528 interchange has two distinct aesthetic treatments consisting of the northern portion with regularly spaced date and sabal palms and a bridge treatment accented with clusters of date palms. The southern portion of the interchange includes an infield retention area ringed with sabal palms.

Figure 2-5: Typical Landscaping Along S.R. 401

There is one two-sided FDOT-permitted Outdoor Advertising Sign Structure located northeast of the Canaveral Barge Canal (Tag CI117 - facing south and Tag CI118 - facing north). This sign structure is owned by Clear Channel Communications. The preferred alternative may impact potential views of this sign structure. View zone impacts will be verified and coordinated during design.

Figure 2-6: Existing Outdoor Advertising Structure

2.9 Bridges and Structures

2.9.1 Overview

The existing bridges have been classified as functionally obsolete due to not meeting current FDOT bridge design standards. Additionally, the 2011 Spaceport Area Transportation Infrastructure Assessment by the Space Coast TPO identified the weight limit and traffic volume capacity as an impediment to expanding port freight operations and maximizing military uses.

In addition to the S.R. 401 bridges just described, the project limits include two other structures to be replaced prior to the replacement of the S.R. 401 bridges; the structures are the two overpasses that support S.R. 528 as it crosses over S.R. 401, south of the S.R. 401 crossings. Although the replacement of the S.R. 528 bridges will be part of a separate contract, a description of these existing structures is included below.

2.9.2 General

The existing S.R. 401 bridges are three separate, parallel structures, comprised of twin southbound structures (Bridge Nos. 700030 and 700031) and a single northbound structure (Bridge No. 700117). The southbound bridges were built in 1963, while the northbound bridge was built in 1972. The northbound bridge carries three 12-foot lanes of vehicular traffic over the canal, with nominal 2-foot shoulders on either side. The southbound bridges were both originally designed to support two 12-foot lanes with 2-foot shoulders on each side, however Bridge No. 700031 (to the west) is currently striped to carry one lane and a wider shoulder. The northbound bridge also supports a 3′-6″ curb on each side, while the southbound bridge has 2-foot curbs. The width of the deck between curbs is 40′-0″ at the northbound bridge and 28′-0″ at each southbound bridge.

Each of the three bridges measures 313′-9″ in overall length, which includes a double-leaf bascule main span, as well as a flanking span and an approach span at each end of each bascule.

The existing channel is centrally located under the bascule spans, with the centerline (CL) of the channel matching the transverse CL of each bridge and providing a 90-foot navigational clearance between fenders.

A single control house is located between the south flanking spans of the Southbound bridges. Presently, the draw is closed from 6:30 AM to 8:00 AM and 3:30 PM to 5:15 PM weekdays only, except holidays. Three hours advance notice is required for bridge openings between 10:00 PM and 5:59 AM. Additionally, the bridges do not open to navigation from 11:00 AM to 2:00 PM on Saturdays and Sundays to reduce vehicular traffic congestion and to ensure the safety of roadways while passengers are transiting to and from the cruise ship terminals.

The existing S.R. 401 southbound roadway horizontal alignment is set on a constant bearing (N 00° 14′ 14″ W) throughout the immediate bridge limits. The profile grade line of southbound S.R. 401 is centered between the two bridges, at 20′-0″ to the left and right of each bridge center line. The existing vertical alignment (profile) consists of a 500′-0″ crest vertical curve with a grade of 3.0% up and 3.0% down.

The existing S.R. 401 northbound roadway horizontal alignment parallels the southbound alignment, and the bridge is centered about the centerline of roadway. Similar to the southbound bridges, the existing vertical alignment (profile) consists of a 500′-0″ crest vertical curve with a grade of 3.0% up and 3.0% down (see figure 2-7).

Lastly, the approach spans of the three S.R 401 bridges cross over Mullet Road, an access road located on the south side of the crossing.

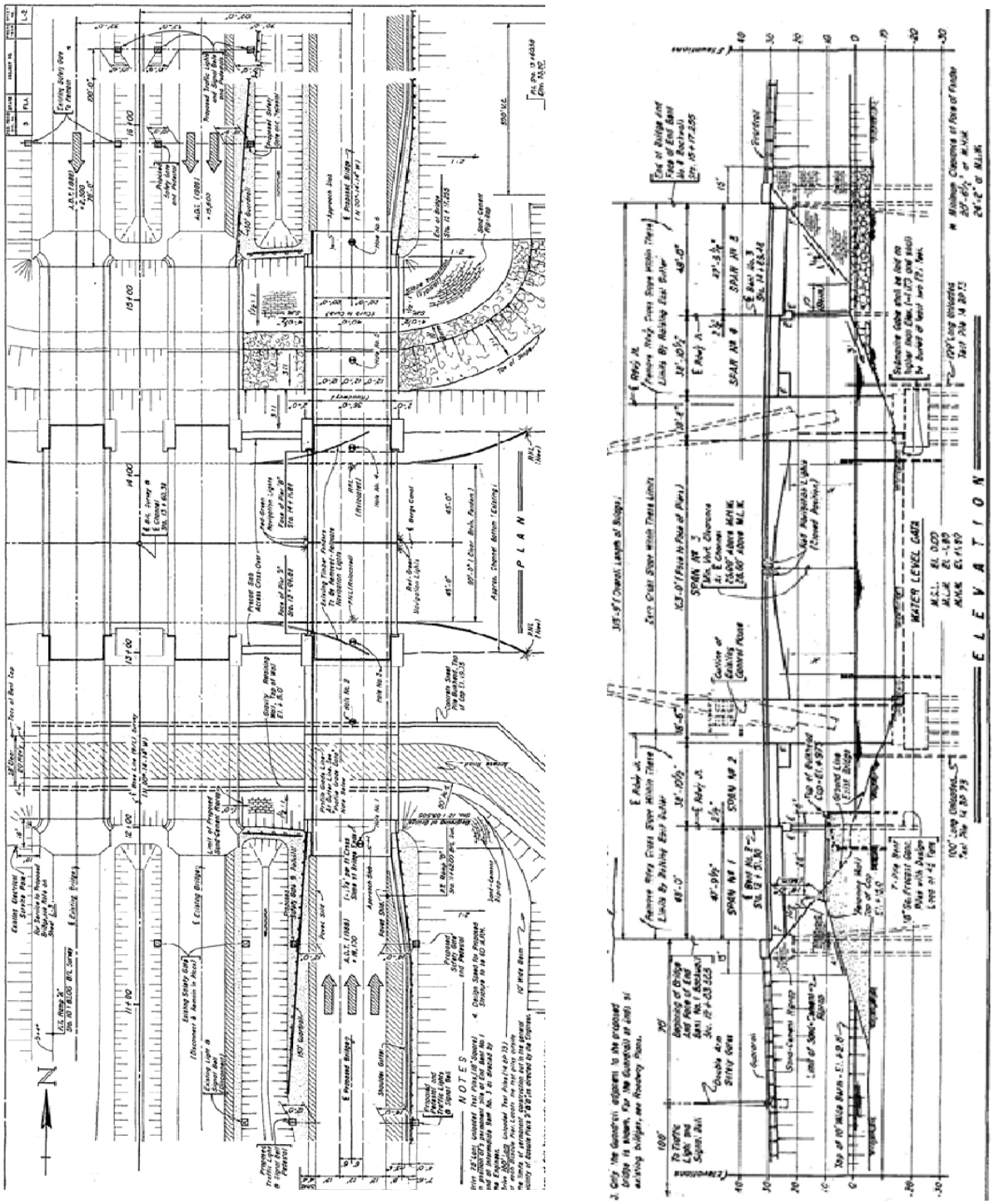


Figure 2-7: S.R. 401 Bridges Plan and Elevation (Elevation Shown at NB Bridge)

2.9.3 Existing Bascule Spans

The existing main spans each consist of a double-leaf bascule spanning 122′-6″ between trunnions (103′-0″ face to face of piers). The bascule framing plan for bridge 700031,(see figure 2-8). The other S.R. 401 bridges feature a similar bascule framing.

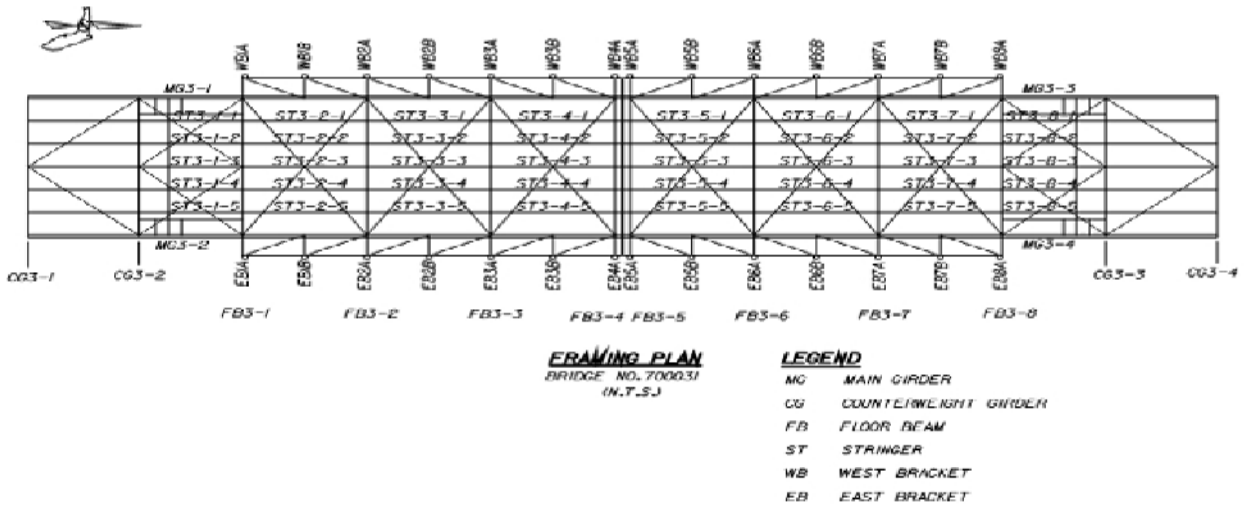


Figure 2-8: Bascule Framing Plan (700031 shown, others similar)

Each bascule leaf consists of two main girders with a framing system of floor beams, stringers, and cross bracing. Each counterweight is supported by two transverse girders that frame into the main girders. The trunnions pass through the main girders and are attached to the trunnion girders. The main girders are 7′-$^{1}/_{2}$″-deep at the trunnion for the southbound bridges and 7′-6$^{3}/_{8}$″-deep at the northbound bridge, and they all taper to 2′-6″ at the free end. The main girders also support the walkway framing on each side.

The deck on all three bascule spans is a 5-inch-deep open steel grid, and 5-inch-deep filled steel grid at the flanking spans. The curbs along the bascule spans also consist of an open steel grid, though only 1.25″ deep, and are cast in place concrete along the flanking spans. Open joints separate the flanking spans on each side from the approach spans.

2.9.4 Flanking Spans

The Flanking Spans are located just north and south of each bascule span and are indicated as spans 2 & 4 in the elevation (see figures 2-9 and 2-10). They measure 38′-10$^{1}/_{2}$″ and they partially overlap the bascule spans, approximately over the counterweight. In all bridges, the flanking spans are separated from the bascule spans by an open joint, to allow for the swinging movement of the main span. The spans are framed with five 30 WF 116 steel beams, spaced at 6′-9″ on the southbound bridges and with six 30 WF 99 spaced at 8′-2″ on the northbound bridge. The beams are connected by diaphragms at mid span and at the intermediate pier. The beams are made composite with a 7″ cast-in-place deck. The curbs are also cast in place.

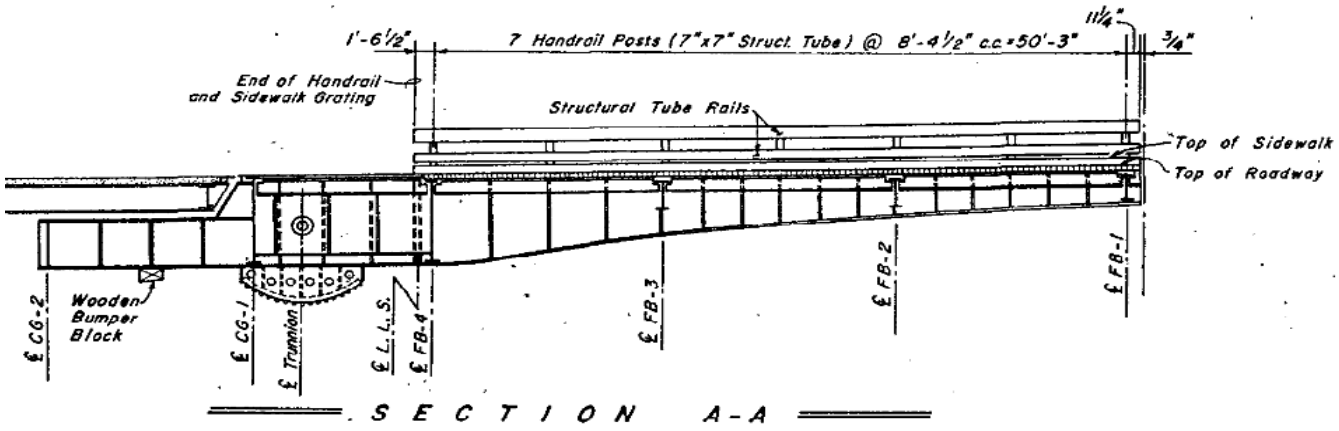


Figure 2-9: Flanking Span Section at the NB Bridge

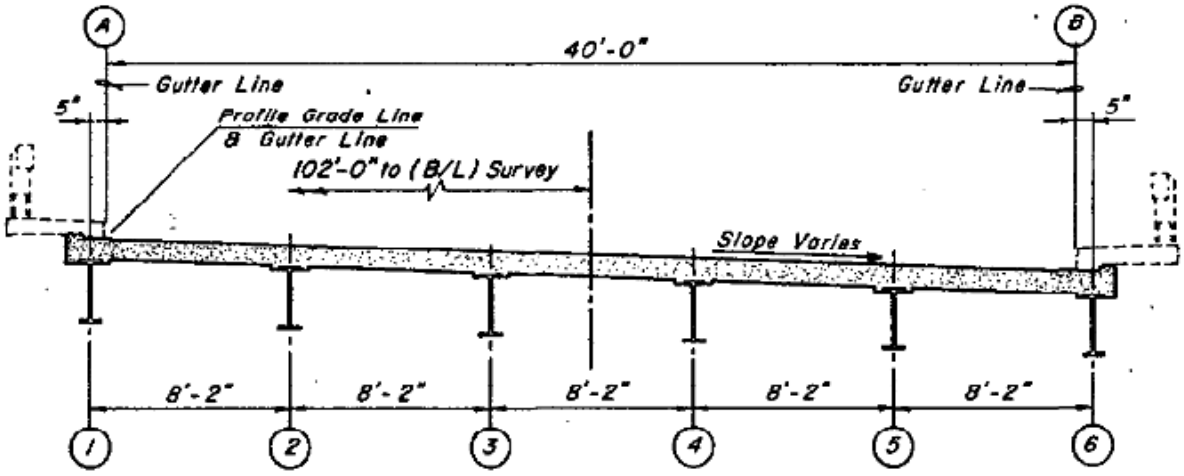


Figure 2-10: Flanking Spans Section at the SB Bridge

2.9.5 Existing Approach Spans

The existing North and South Approach Spans are indicated in the elevation (see figures 2-11).

On the northbound bridge they are framed similarly to the flanking spans but use American Association of State Highway and Transportation Officials (AASHTO) Type II beams and have a slightly longer span, measuring 48′-0″. The spacing of the beams is identical to the flanking spans, as are the deck and curbs. On the southbound bridges the approach spans are also framed with AASHTO type II beams but spaced at nine feet.

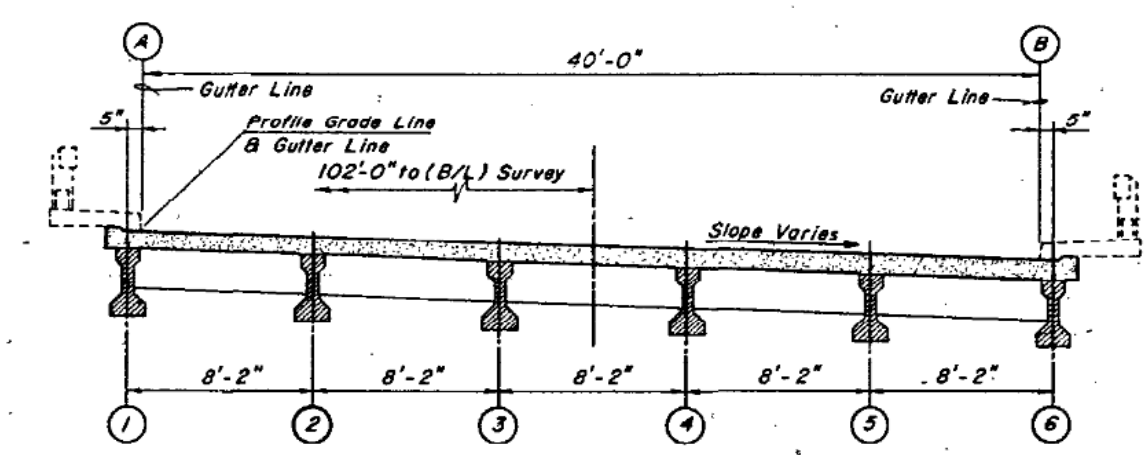


Figure 2-11: Approach Spans Section at the SB Bridges

2.9.6 Substructures and Foundations

The substructure of each bridge is as laid out in the plan view shown (see figure 2-12), (northbound bridge, and southbound are similar). The bascule piers are made of concrete and support one end of the flanking spans and the trunnions, as well as create a platform for the bascule spans machinery. They are constructed on steel 14 BP 73 piles, capped by a concrete footing. At the southbound bridges, the outermost lines of piles, running east to west, are battered 1″ per foot.

The end and intermediate bents, supporting the approach spans and flanking spans, are constructed on 18″ square pre-cast, pre-stressed concrete piles. The end bents are connected to a backwall and wing walls on either side. At the northbound bridge every other pile is battered 2″ per foot, as indicated by the arrows (see figure 2-13). The bearings at the end bents are fixed. At the intermediate bents, only the outermost piles are battered, $1^1/_2$″ per foot. The two lines of bearings at the intermediate bends allow for expansion and a roadway joint separates the flanking span from the approach span.

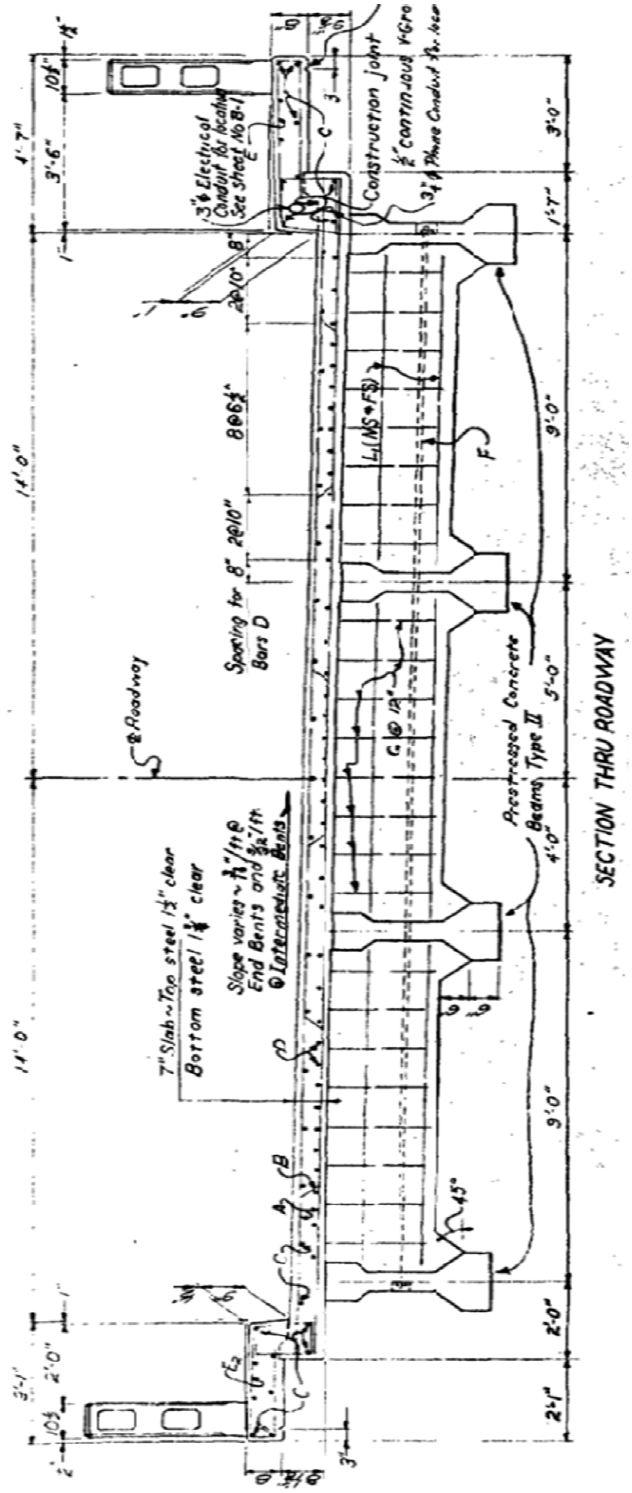


Figure 2-12: Approach Span Section at NB Bridge

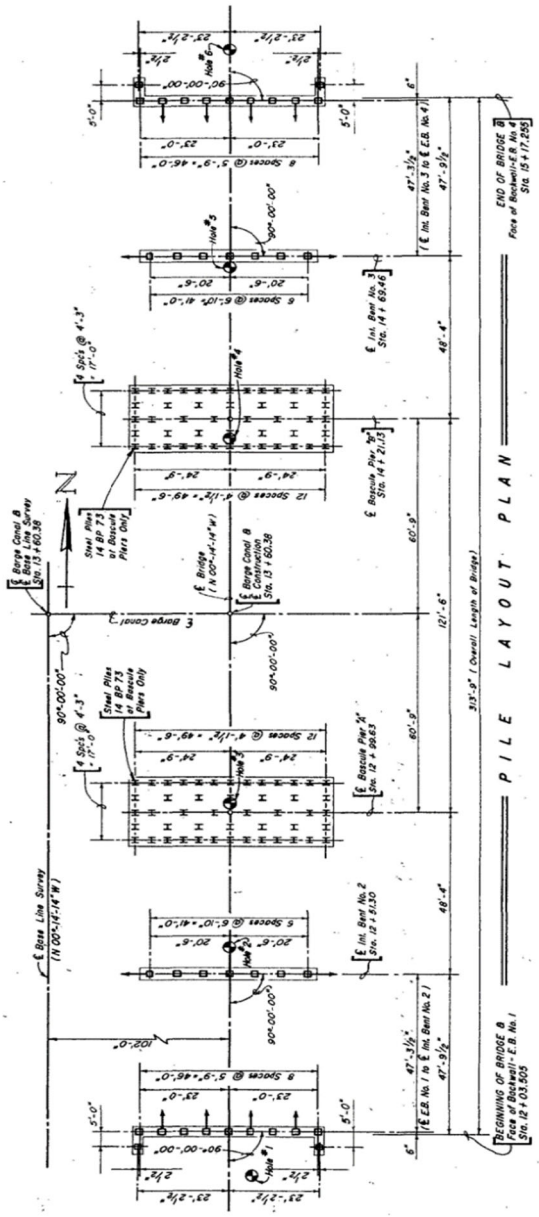


Figure 2-13: Foundation Layout (NB Bridge Shown)

The machinery on each south bascule towers is connected to the machinery on the corresponding north tower via submarine cables. One continuous fender on each side of the navigation channel protects the bascule piers.

In addition to the existing bridges' substructure, a concrete sheet-pile bulkhead is also located within the bridges' footprint, under the south approach spans, intended to support Mullet Road, as well as a retaining wall, intended to cut the grading around the south end bents, to create room for the road.

Lastly, in addition to the bridge's substructure, two other features can be found within the bridge's footprint, under the south approach spans, intended to support Mullet Road. There is a concrete sheet-pile bulkhead, running east to west along the channel on the north side of Mullet Road, and a retaining wall on the south side of the road, cutting the riprap grading around the south end bents, to create room for the road.

2.9.7 Inspection Reports

The following information has been summarized from the 2021 *Bridge Inspection Reports* performed and provided by the FDOT and the existing bridge plans. Copies of these reference materials are in the project file.

Bridge No. 700030

The overall National Bridge Inventory (NBI) ratings for S.R. 401 southbound Bridge No. 700030 are shown in Table 2-7. The bridge was under rehabilitation in 2010.

Table 2-7: NBI Ratings Northbound

	Southbound 700030
Deck:	6 Satisfactory
Superstructure:	6 Satisfactory
Substructure:	6 Satisfactory
Channel:	7 Minor Damage
Perf. Rating:	GOOD
Suff. Rating:	68.8
Health Index:	90.08

No major deficiencies were noted in the last inspection of the mechanical and electrical systems, and most findings were assigned a Condition State (CS) CS-1 condition rating. Some level of wear was noted at the open gear teeth, shaft bearings, locks, and trunnion track, as well as light, spotty pitting on the high-speed pinion. Bearing clearances in excess of an American National Standards Institute (ANSI) RC9 fit were noted. Cracking and delamination is noted in the counterweights. These conditions are considered minor and do not warrant corrective action. The drum break is due for replacement or recoating and a few electrical items need ordinary maintenance, such as cleaning, painting, and minor repairing. Two non-compliant items are noted. Many rack mounting bolts, particularly at the South Leaf, are not installed in reamed holes as required per the specification and approved shop drawings. Similarly, the alignment of the shoes to the lock bar and measured clearances at the guides and receivers did not meet the project

specifications for the 2011 rehabilitation project. Both these conditions have been accepted by the FDOT and no corrective action needed.

The bridge structural elements were also in "satisfactory" condition. Light corrosion was noted throughout the open grid deck, rated CS-1, with less than 10% rated CS-2. The concrete filled steel grid was found in similar, but slightly worse condition. The condition of concrete deck slabs is rated CS-1, with some delamination and spalls. The stringers, girders and floor beams present some corrosion, rated up to CS-3, and some cracking was found in the floor beams. The substructure exhibits some spalling, delamination and cracking and is overall rated "satisfactory".

Bridge No. 700031

The overall NBI ratings for S.R. 401 southbound Bridge No. 700031 are shown in Table 2-8. The bridge was under rehabilitation in 2010.

No major deficiencies were noted in the last inspection of the mechanical and electrical systems, and most findings were assigned a CS-1 condition rating. Some level of wear was noted at the open gear teeth, shaft bearings, locks, and trunnion track, as well as very minor spots of surface corrosion on the internal gearing. Bearing clearances in excess of an ANSI RC9 fit were noted. None of these conditions reported warranted a corrective action. The north leaf motor break is due for replacement or recoating and a few electrical items need ordinary maintenance, such as cleaning, painting, and minor repairing.

Table 2-8: Foundation Layout (Northbound Bridge Shown)

	Southbound 700031
Deck:	6 Satisfactory
Superstructure:	5 Fair
Substructure:	5 Fair
Channel:	7 Minor Damage
Perf. Rating:	FAIR
Suff. Rating:	77
Health Index:	93.47

The bridge structural elements were found to be in "fair" condition. Light corrosion was noted throughout the grid deck, rated CS-1. The condition of concrete deck slabs is rated CS-1, with some delamination and spalls. The stringers, girders and floor beams present some corrosion, rated up to CS-3. The substructure exhibits some spalling, delamination and cracking and is overall rated "fair".

Bridge No. 700117

The overall NBI ratings for S.R. 401 northbound Bridge No. 700117 are shown in Table 2-9. The bridge underwent rehabilitation in 2010.

Table 2-9 NBI Ratings for S.R. 401 Northbound Bridge

	Northbound 700117
Deck:	6 Satisfactory
Superstructure:	5 Fair
Substructure:	6 Satisfactory
Channel:	7 Minor Damage
Perf. Rating:	FAIR
Suff. Rating:	60.6
Health Index:	95.04

No major deficiencies were noted in the last inspection of the mechanical and electrical systems, findings were assigned a CS-1 or CS-2 condition rating.

Damage to the gear teeth from abrasive material was noted. The abrasive scores on the worn portions of the gear teeth are not self-destructive and exhibit some plastic flow, indicating that the previous abrasive scores are wearing in. No corrective action was recommended. Bearing clearances and clearances between the shoes of West Span lock receiver and lock bar, in excess of an ANSI RC9 fit were noted and rehabilitation recommended to reduce these clearances. The south leaf motor break does not comply with FDM section 260.2.2 minimum sidewalk width criteria, which requires 5′-0″ min. replacement or recoating and a few electrical items need ordinary maintenance, such as cleaning, painting, and minor repairing.

The bridge structural elements were found to be in “fair” condition. Light corrosion was noted throughout the grid deck, rated CS-1. The condition of concrete deck slabs is rated CS-1, with some delamination and spalls. The stringers, girders and floor beams present some corrosion, rated up to CS-3. The substructure exhibits some spalling, delamination and cracking and is overall rated “Satisfactory”.

Non-standard Features

A number of features on the existing bridges are non-compliant with current codes, and therefore, as previously mentioned, the bridges have all been classified as “functionally obsolete”. In the current configuration, the northbound bridge, and one of the southbound bridges, have a 2-foot-wide shoulder on each side of the travel lanes, while current FDM requirements call for a minimum of 12 feet (see FDM table 211.4.1).

2.9.8 Load Rating

The bridge ratings for all three bridges are satisfactory, and none of the bridges are currently posted.

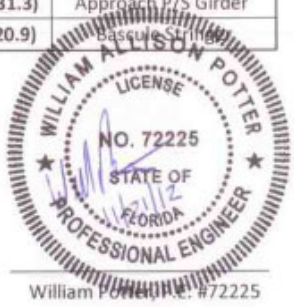
An analytical load rating of the two older bridges (Nos. 700030 and 700031), completed in 2011 resulted in a load rating of 47.9 tons (operating) for the HS-20 truck. The controlling element was the bascule span floor beams (service rating). As a result of the load rating the FDOT Permit Office requested that the Structures Research Center investigate load testing the bridges. The test included all the main span primary members – floor beams, main girders, and stringers of Bridge No. 700030, which was determined to be in slightly worse condition and therefore chosen for testing. The prestressed girders on the approach were not tested as it was determined that the analytical rating was sufficient.

Results from the testing indicate that the theoretical analysis was conservative, and the new results were found to be more favorable. The new results conclude that the prestressed concrete approach spans control with a 0.87 (31.3 tons) inventory and 1.46 (52.5 tons) operating rating for shear for the HS-20 truck loading. The analytical load rating summary based on the diagnostic load test and rating is shown in Table 2-10, for all components.

Table 2-10: Summary of Load Rating Factors per Diagnostic Load Test for Bridges 700030 and 700031

Truck	Bascule Stringer (S)	Bascule Floor Beam (S)	Bascule Main Girder Shear (V)	Bascule Main Girder Moment (M)	Flanking Span Stringer (S)	Flanking Span Cross Girder (M)	Approach Girder (V)	Controlling Rating Factor RF (Tons)	Controlling Member
Material	Steel	Steel	Steel	Steel	Steel Composite	Steel Composite	P/S Concrete		
Operating Rating									
SU2	**2.47**	2.56	3.67	3.39	4.90	3.37	2.58	**2.47 (42.0)**	Bascule Stringer
SU3	1.61	**1.36**	1.89	1.86	2.63	1.78	1.44	**1.36 (44.8)**	Bascule Floor Beam
SU4	1.45	**1.27**	1.79	1.72	2.45	1.79	1.38	**1.27 (44.4)**	Bascule Floor Beam
C3	2.47	2.36	2.46	2.75	4.53	2.87	**2.30**	**2.30 (64.4)**	Approach P/S Girder
C4	**1.61**	1.63	1.89	2.08	3.29	2.08	1.64	**1.61 (59.0)**	Bascule Stringer
C5	1.77	**1.61**	1.73	1.95	3.19	1.96	1.63	**1.61 (64.4)**	Bascule Floor Beam
ST5	1.95	**1.71**	1.99	2.27	3.28	2.18	1.78	**1.71 (68.4)**	Bascule Floor Beam
HS20	1.70	1.63	1.79	1.94	2.91	1.78	**1.46**	**1.46 (52.5)**	Approach P/S Girder
Tandem	**1.46**	1.50	2.47	2.05	3.00	2.19	--	**1.46 (35.0)**	Bascule Stringer
Inventory Rating									
HS20	1.02	0.98	1.07	1.16	1.74	1.06	**0.87**	**0.87 (31.3)**	Approach P/S Girder
Tandem	**0.87**	0.90	1.47	1.31	1.80	1.31	--	**0.87 (20.9)**	Bascule Stringer

S – Service Rating Factor, V – Shear Rating Factor, M – Strength Rating Factor



William Potter, P.E. #72225

2.9.9 S.R. 528 Bridges

The existing eastbound and westbound S.R. 528 bridges over S.R. 401 (Bridge Nos. 700074 and 700140) were built in 1971. They consist of two identical structures, mirrored about the centerline of S.R. 528 (see figure 2-14).

The existing spans vertical clearance over the S.R. 401 southbound lanes is 16′-6″, and the vertical clearance over the S.R. 401 northbound lane is 16′-5″. The horizontal clearance, measured from each face of the center piers to the edge of the northbound and southbound S.R. 401 travel lanes on either side, is 18′-0″. The center piers are shielded by guardrails. The westbound bridge underwent a barrier upgrade in 2001, from a concrete curb with handrail to a 32″ F-Shape traffic railing.

The existing S.R. 528 eastbound and westbound roadway horizontal alignment is set on a constant bearing (N 83° 45′ 06″ E) throughout the immediate bridge limits. Both bridges are centered about the profile grade lines of S.R. 528, which are located 32′-0″ to the left and right of the centerline. The existing vertical alignment (profile) consists of a 600′-0″ crest vertical curve with a grade of 2.8% up and 2.6% down.

Superstructure

The spans are supported on AASHTO Type IV pre-stressed girders spaced at 5′-0″ and made composite with a 7-inch cast-in-place deck. Both bridges have an out-to-out width of 35′-4″. The eastbound bridge carries two 12′-0″ lanes and 4′-6″ shoulders, for a clear roadway width of 33′-0″. The westbound bridge carries two 12′-0″ lanes with 4′-1.5″ shoulders, for a clear roadway width of 32′-3″.

Each bridge is comprised of two simple spans of 107′-6″ each, for a total length of 215′-0″ between abutments.

Substructure

Each of the S.R. 528 spans are constructed on concrete abutments and a concrete center pier, supported by 18″ precast concrete piles. The abutments are slightly skewed with respect to the centerline of bridge. Each center pier consists of two pier columns supporting a pier cap. Each column has a separate footing, supported on piles.

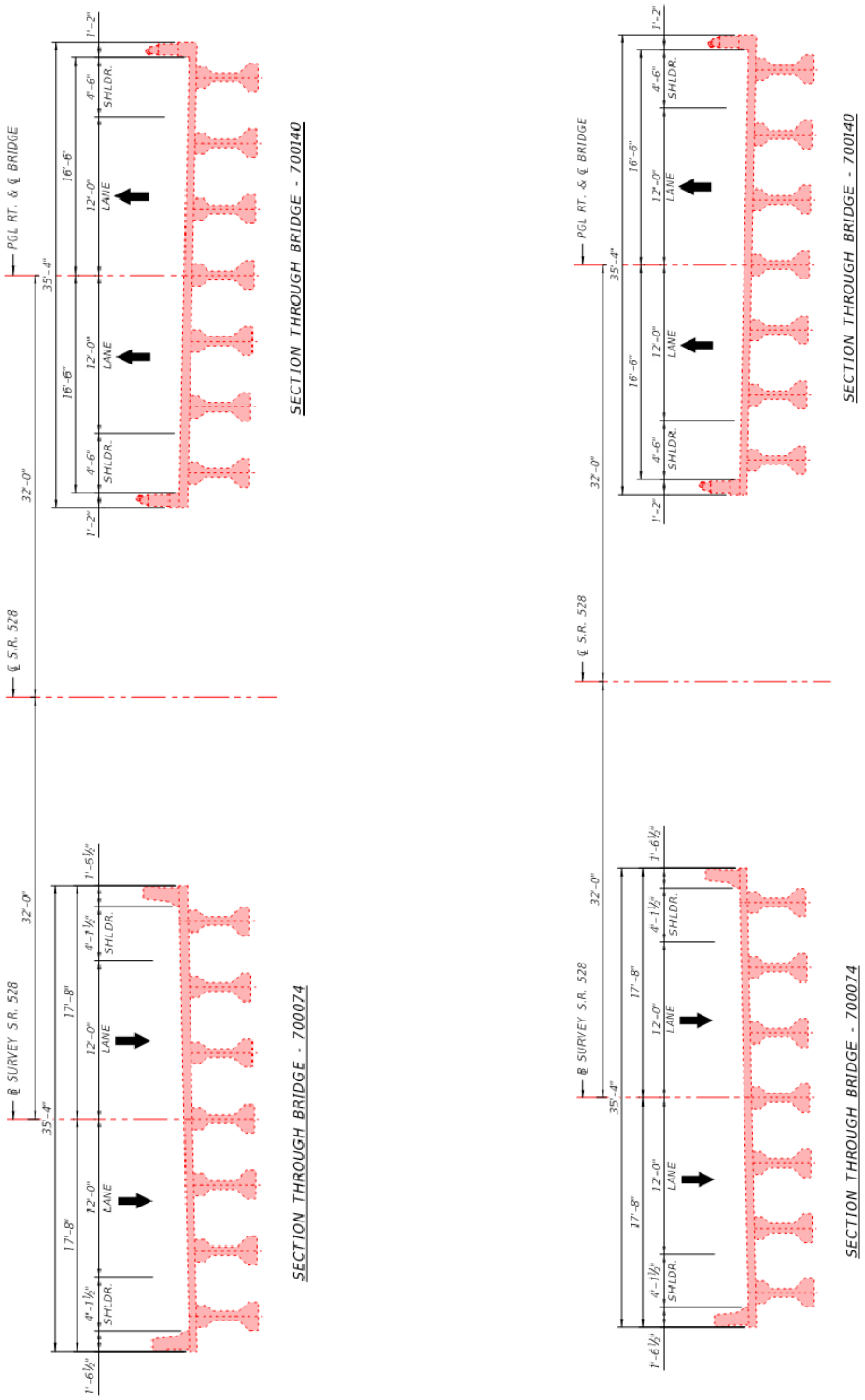


Figure 2-14: Typical Section of the S.R. 528 Bridges over S.R. 401

Inspection Reports

The S.R. 528 bridges over S.R. 401 have sufficiency ratings of 90.0. Per the 2019 Bridge Inspection Report for the eastbound bridge, there is corrosion of the anchor bolts at the bearings, as well as a broken anchor bolt at end bent 1 for one of the beams. Two of the beams on the bridge have impact spalls at the bottom flange, and one of the beams has a horizontal crack in the bottom flange. There are areas of adhesion loss in the joint sealer. Per the 2019 Bridge Inspection Report for the westbound bridge, the prestressed concrete girders near the center pier have spalls with exposed prestressing strands. There is also corrosion of the anchor bolts at the bearings, as well as a missing anchor bolt at end bent 3 for one of the beams. There are areas of adhesion loss in the joint sealer and header delamination spalls. The eastbound bridge superstructure had an NBI rating of 6 – Satisfactory, while the deck and substructure have an overall NBI rating of "7 – Good" at the time of inspection. The westbound bridge superstructure and substructure had an overall NBI rating of "7 – Good" at the time of inspection. Work order recommendations of some of the deficient items are mentioned in the inspection reports.

Non-Standard Features

The existing shoulder widths on both bridges do not comply with AASHTO and FDM requirements for minimum shoulder widths. FDM Section 260.1.1 currently requires a 10′-0″ outside shoulder and 6′-0″ inside shoulder, at a minimum.

2.9.10 Bridge Horizontal and Vertical Clearances

The existing S.R. 401 bridges are three parallel double-leaf bascule bridges that each measure 313′-9″ in overall length, and each having five spans (one bascule, two steel and two concrete). Each bridge has a vertical clearance of 25 feet at mean high water in the closed to navigation position and a horizontal clearance of 90 feet between the fender system.

2.9.11 Channel Data

The existing S.R. 401 bascule bridge structures crosses over the Canaveral Barge Canal on a perpendicular alignment. The clear channel width between fenders is 90 feet. Vertical clearance with the three bascule bridges down is 25 feet above mean high water. The bridges currently offer unlimited vertical clearance for vessels passing through with the bridge bascule spans in the upright position

2.9.12 Bridge Openings

Bridge opening information was reviewed to complete the Navigational Survey and Study in April 2022. From January 2020 through March 2020, there were no bridge openings due to the Canaveral locks being closed for dewater and repairs as part of an U.S. Army Corps of

Engineers project. For those months, the 2018 and 2019 average figures were used for analysis purposes. 2021 data was not used as the full-year data was not available at the time of the navigation study. Key metrics are shown in Table 2-11.

Table 2-10: Historic Bridge Opening Data Key Metrics, 2018 – 2020

Key Metric	2018	2019	2020[1]
Total Bridge Openings (Vessels & Maintenance)	1,191	1,138	1,329
Total Bridge Openings (Vessels Only)	1,136	1,027	1,220
Number of Vessels Requiring Openings	1,252	1,217	1,415
Ratio of Vessels Requiring Openings to Actual Openings	0.91	0.84	0.86
Average Bridge Opening Time (Vessels Only)	0:06:14	0:06:29	0:06:29
% Of Bridge Openings – Maintenance	4.6%	9.8%	8.2%
% Of Bridge Openings – Vessels	95.4%	90.2%	91.8%
% Of Bridge Openings – Powerboats	36.6%	37.4%	37.0%
% Of Bridge Openings – Sailboats	63.4%	62.6%	63.0%
Peak Months	March, April, May, November		
Peak Days	Friday, Saturday, Sunday		
Peak Hours – Weekends	10 am – 11 am, 2 pm – 3 pm		
Peak Hours – Weekdays	8 am – 2 pm		

Source: Florida Department of Transportation District 5
[1] 2020 data adds average vessels and openings from 2018 and 2019 to account for bridge closure.

2.10 Existing Environmental Features

During the Efficient Transportation Decision-Making (ETDM) programming screen, the National Marine Fisheries Service assigned Degree of Effect (DOE) of “Moderate” and the St. Johns River Water Management District assigned a DOE of “Minimal”. The FDOT has assigned a DOE of “Moderate” based on the National Marine Fisheries Service’s comment regarding the habitats in the area designated as essential fish habitat (EFH) and the mangrove and seagrass habitats also considered Habitat Areas of Particular Concern (HAPC).

2.10.1 Natural Resources

Wetlands and Other Surface Waters

In accordance with the FDOT PD&E Manual *(July 1, 2020), Executive Order 11990, Protection of Wetlands,* as well as applicable federal and state regulatory requirements (*Section 404 of the Clean Water Act* and *Chapter 373, Florida Statute*, respectively) a wetland and other surface waters (OSW) evaluation was conducted for the project. The objectives of this evaluation were to identify existing wetlands and OSW’s, evaluate potential impacts to them, and to assess the function and value of wetlands potentially impacted by the project (See figures 2-15 and 2-16) illustrate the location of wetlands and OSW sites.

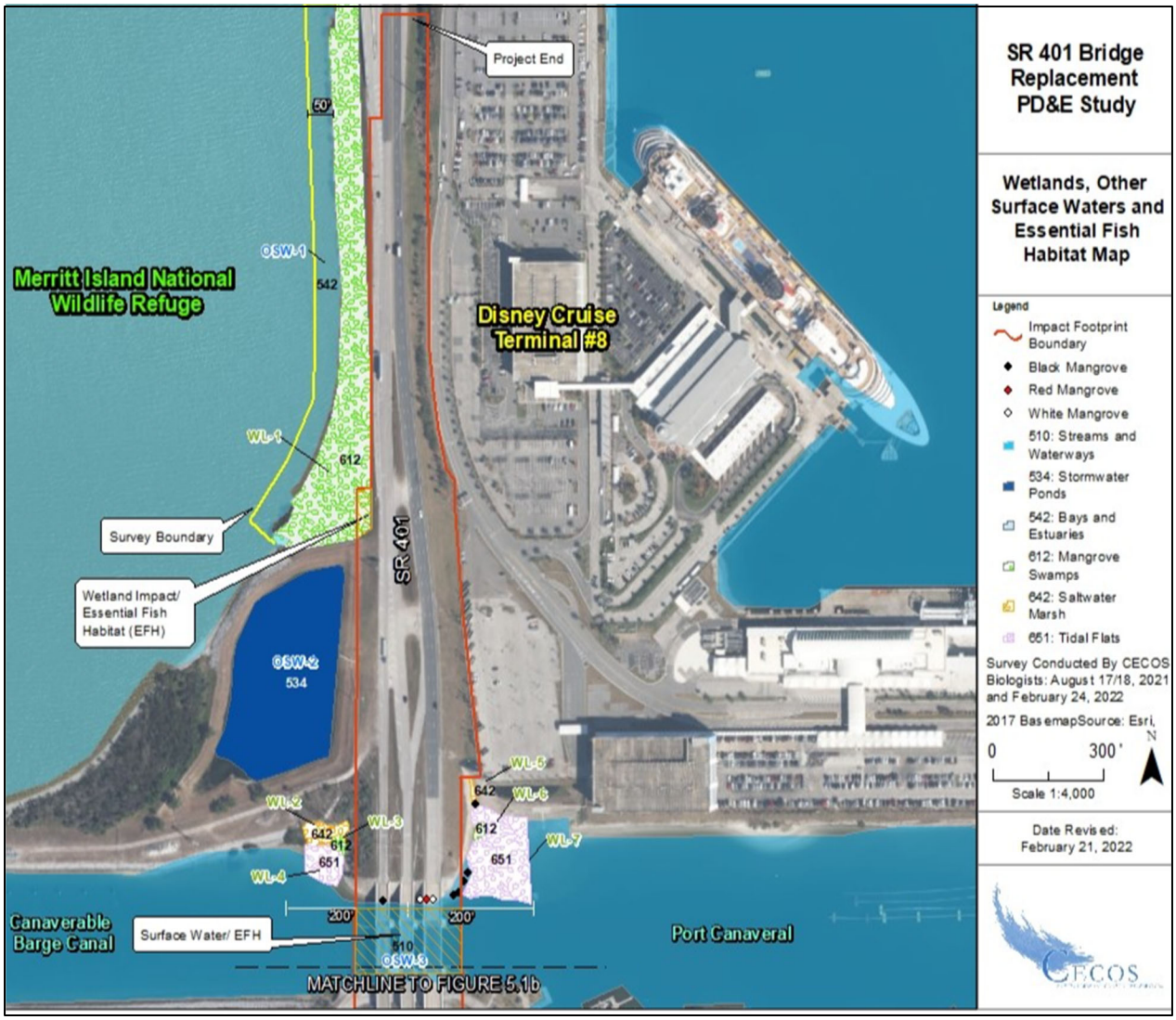


Figure 2-15: Wetlands and OSW North

Figure 2-16: Wetlands and OSW South

Table 2-12 summarizes those areas found within and adjacent to the proposed project footprint. The size, hydrologic contiguity, and vegetative structural diversity are described in this table as well as Florida Land Use, Cover and Forms Classification (FLUCCS) and National Wetlands Inventory (NWI) codes to classify the type of wetland/OSW. Six individual black mangroves, one individual red mangrove, and two individual white mangroves were identified underneath and adjacent to the northern side of the S.R 401 bridges. It is not anticipated that these individual mangroves will be impacted.

Table 2-11: Wetlands and Other Surface Waters

ID	FLUCCS Code/ NWI Code	Approx. Area (Acres)	Dominant Wetland Vegetation	Hydric Soils (Historic)	Hydrologic Connection to Waters of the US
WL-1	612 E2SS3M	3.33	Red (*Rhizophora mangle*), black (*Avicennia germinans*) & White (*Laguncularia racemose*) mangroves, Buttonwoods (*Conocarpus erectus*), Pond apple *(Annona glabra)*, cabbage palm (*Sabal palmetto)*, sea oxeye daisy (*Borrichia frutescens)*	No (Cu)	Yes
WL-2	642 E2UB3	0.13	Black & white mangroves, sea oxeye daisy, sea purslane (*Sesuvium portulasastrum*), beach morning glory (*Ipomoea pes-caprae),* saltgrass (Distichlis spicata	No (Cu)	Yes
WL-3	612 E2UB3	0.04	Black mangrove	No (Cu)	Yes
WL-4	651 E2UB3	0.25	Tidal flat- no vegetation	No (Cu)	Yes
WL-5	642 E2UB3	0.01	Beach morning glory, sea purslane	No (Cu)	Yes
WL-6	612 E2UB3	0.02	Black mangrove	No (Cu)	Yes
WL-7	651 E2UB3	0.78	Tidal flat- no vegetation	No (Cu)	Yes
WL-8	612 PSS3M	13.91	Black and white mangroves, glasswort (*Salicornia bigelovii*), saltwort (*Batis maritima*)	Yes (Tu)	Unknown
WL-9	612 PSS1	0.66	Black mangroves, white mangroves, marsh elder (*Iva frutescens*), cabbage palm	Yes (Tu)	Unknown (connected to WL-8)
WL-10	631 PSS1	0.50	Saltbrush (*Baccharis halimifolia*), cabbage palm, coastal willow (*Salix hookeriana*)	Yes (Tu)	No
WL-11	641 PSS1	0.14	Cattail (*Typha* sp.)	No (Cu)	Yes
WL-12	612 E2SS3M	35.26	Mangrove fringe	No (Cu)	Yes
WL-13	612 PSS3	1.96	Mangrove fringe. Mitigation area	No (Cu)	Unknown
WL- 14	612 PSS3	1.04	Mangrove fringe. Mitigation area	No (Cu)	Unknown
OSW-1	542 E1UBL	5.22	Discontinuous, sparse seagrass (*Halodule wrightii),* culerpa *(Culerpa prolifera), red algae*	N/A (W)	Yes

Table 2-11: Wetlands and Other Surface Waters

ID	FLUCCS Code/ NWI Code	Approx. Area (Acres)	Dominant Wetland Vegetation	Hydric Soils (Historic)	Hydrologic Connection to Waters of the US
OSW-2	534 PUBHx	0.56	Stormwater pond- no vegetation	N/A (W)	Yes
OSW-3	510 E1UBL	N/A*	Not present	N/A (W)	Yes
OSW-4	534 PUBHx	9.63	Stormwater pond- no vegetation. Mitigation area.	N/A (W)	Yes
OSW-5	534 PUBHx	2.50	Stormwater pond- no vegetation. Mitigation area.	N/A (W)	Yes
OSW-6	524 PUSC, PUSA, PUBHx	8.74	Shallow open water area	N/A (W)	Unknown

FLUCCS: *510 – Streams and Waterways; 534 – Stormwater ponds; 542 – Bays and Estuaries; 524 – Enclosed saltwater ponds; 612 – Mangrove swamps; 631 – Wetland scrub; 641 – Freshwater marsh; 642 – Saltwater marsh; 651 – Tidal flats*
NWI: *PUBHx = Palustrine, unconsolidated bottom, excavated; E1UBLx = Estuarine, subtidal, unconsolidated bottom, excavated; E1UBL = Estuarine, subtidal, unconsolidated bottom; PUSC = Palustrine, unconsolidated shore, seasonally flooded; PUSA = Palustrine, unconsolidated shore, temporarily flooded; E2SS3M = Estuarine, intertidal, scrub-shrub wetlands; E2US3 = Estuarine, intertidal, unconsolidated shore, mud; PSS3/PSS1 = Palustrine, scrub-shrub wetland*
Soils: *Tu= Turnbull and Riomar soils, tidal; Ca= Canaveral-Anclote complex, gently undulating; Cu= Canaveral-Urban land complex; W = Water*
Note*: *Extends beyond project limits*

Threatened and Endangered Species

This project was evaluated for impacts to wildlife and habitat resources, including protected species in accordance with *50 Code of Federal Regulations (CFR) Part 402 of the Endangered Species Act (ESA) of 1973, as amended, and Part 2, Chapter 16 (July 1, 2020) of the FDOT PD&E Manual.* Wildlife species are protected under the ESA, the *Migratory Bird Treaty Act (MBTA*), and the State of Florida, pursuant to *Florida Statute 379.411*.

Wetland, estuarine and open water habitats are present within the project, provide potential nesting and foraging habitat for federal and state-listed species. Critical habitat for the manatee exists within the project corridor and the Canaveral Barge Canal also provides potential habitat and access to and from the Indian River Lagoon/Ocean for manatees, sea turtles, giant manta ray, and smalltooth sawfish. Fringe mangrove swamps within and adjacent to the project corridor provide both EFH and potential suitable foraging habitat for listed species. Tidal flats and salt marshes are also present by the bridge (north side) and may also provide foraging habitat for listed bird species as well as marine animals. Table 2-13 lists federally listed species in the project area.

Table 2-13: List of Federally Listed Species			
Common Name	**Listing Status**	**Common Name**	**Listing Status**
Green sea turtle	FT	Wood stork	FT
Loggerhead sea turtle	FE	Eastern black rail	FT
Hawksbill sea turtle	FE	Florida scrub-jay	FT
Leatherback sea turtle	FE	West Indian (Florida) Manatee	FT
Kemp's ridley sea turtle	FE	Southeastern beach mouse	FT
Eastern indigo snake	FT	Giant manta ray	FE
Atlantic salt marsh snake	FT	Smalltooth sawfish	FE
Piping plover	FT	Carter's mustard	FE
Rufa red knot	FT	Lewton's polygala	FE
Key: FT – Federal Threatened Listing Status, FE – Federal Endangered Listing Status			

Essential Fish Habitat

This project was evaluated for impacts to EFH in accordance with *16 U.S.C 1801 of January 12, 2007, as amended, Magnuson-Stevens Fishery Conservation and Management Act,* and *the FDOT PD&E Manual*.

EFH describes all waters and substrate necessary for fish to spawn, breed, feed, or grow to maturity. The NMFS EFH Mapper indicates EFH in the project area as well as HAPC. HAPC's are subsets of EFH that are rare, ecologically important, susceptible to human-induced degradation, or located in an environmentally stressed area.

Mangroves provide nursery, foraging, and refuge habitat for federally managed fishery species (e.g., snapper/grouper species), as well as for other commercially and recreationally important fish. Additionally, mangroves control runoff and turbidity by stabilizing sediment, indirectly supporting fishery habitat. Potential EFH present includes mangroves, salt marsh, and estuarine benthic habitats.

A mangrove fringe is present on the northwest side of S.R. 401, north of the bridge. This area may provide foraging, nursery, and refuge habitat for juvenile fish. Additionally, just west of the mangrove fringe, marine benthic habitat includes sandy muck mixed with shell hash and algae as well as tidal flats and black mangroves. Sporadic, sparse patches of seagrass (*Halodule wrightii*) are also present.

The substrate within the Canaveral Barge Canal consists of a course sandy-shell sediment devoid of vegetation. Oysters were observed on the rip rap and the bulkhead wall. Additionally, federally managed fisheries species associated with mangrove and seagrass habitat may include species in the snapper-grouper complex.

2.10.2 Sociocultural Resources

During the project's ETDM programming screen, The U.S. Environmental Protection Agency reviewed this topic and assigned a DOE of "Minimal" since a "*social GIS analysis within 500 feet identified one 2010 U.S. Census Block with a minority population greater than 40%.*" The FDOT has assigned a DOE of "Minimal" for this category.

Land Use

The existing and future land use within and adjacent to the project corridor has been designated Port Land use (see figure 2-17), which includes transportation and Port facilities. There are no residential uses in the area.

Figure 2-17: Land Use

2.10.3 Cultural Environment

Section 4(f) Resources

Several recreational resources and potential 4(f) resources exist near the project corridor. Those include Rodney S. Ketchum Park, the Indian River Lagoon Scenic Byway, the Florida Circumnavigational Paddling Trail, and the A1A Urban Trail. Additional information on each resources existing conditions is depicted (see figure 2-17).

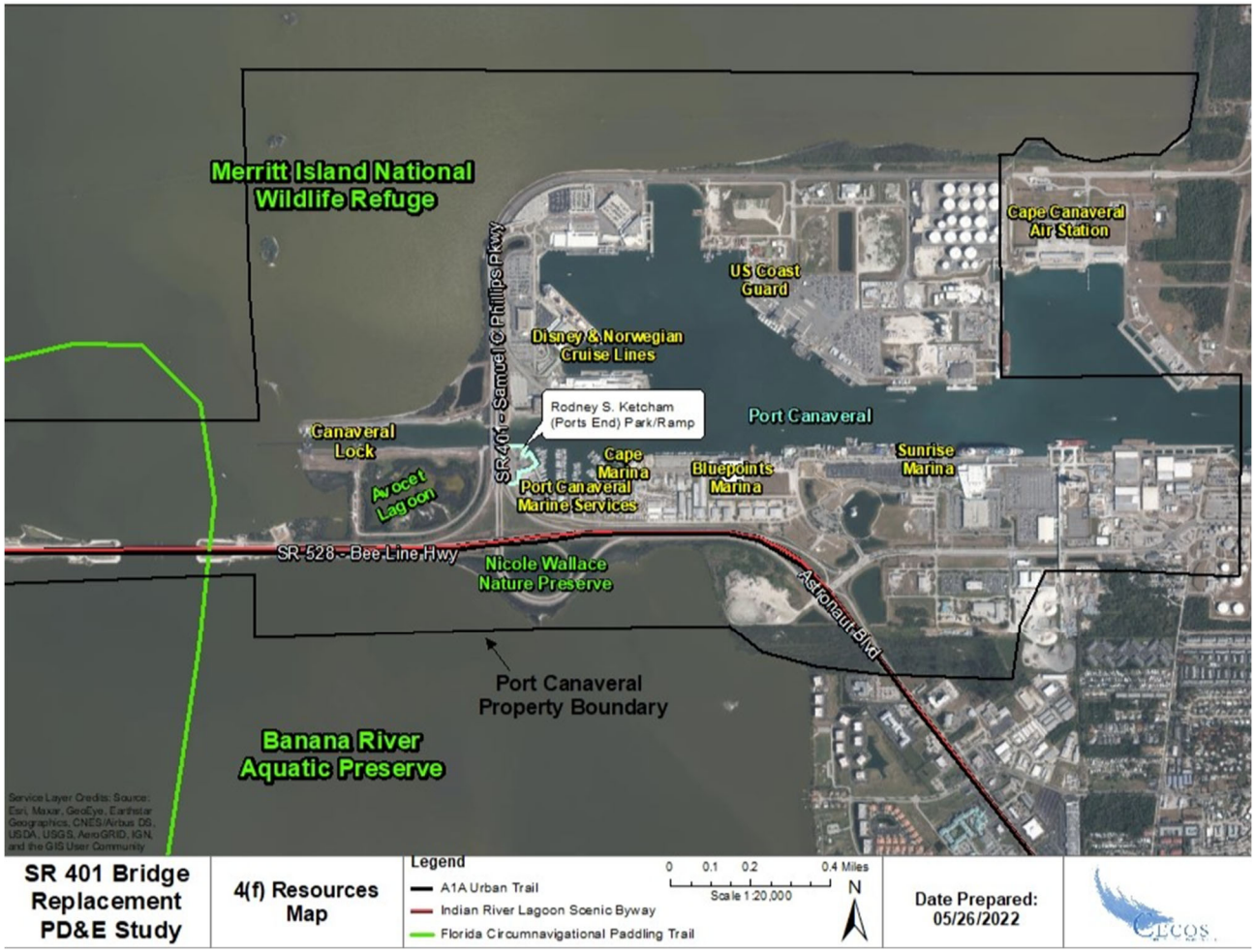


Figure 2-18: Section 4(f) Resources

Rodney S. Ketchum Park

Rodney S. Ketchum Park, pictured in Figure 2-19, is a four-acre public park and Section 4(f) resource owned by the Canaveral Port Authority is located directly east of S.R. 401 and south of the Canaveral Barge Canal. This park includes boat-launch ramps, fish cleaning tables, picnic tables with pavilions, a restroom, and parking.

Figure 2-19: Rodney S. Ketchum Park

Florida Circumnavigational Paddling Trail

The Florida Circumnavigational Paddling Trail is a 1,515-mile-long saltwater paddling trail and Section 4(f) resource that traverses throughout Florida. This trail runs through the Banana River, just west of the project corridor.

Potential Section 4(f) resources include:

Indian River Lagoon Scenic Byway

The Indian River Lagoon Scenic Byway is a 130-mile-long scenic byway running along the Indian River Lagoon. The byway consists of several roadways and includes S.R. A1A, which runs east to west at the southern end of the project corridor.

A1A Urban Trail

The A1A Urban Trail consists of the sidewalk parallel to S.R. A1A and spans more than 40 miles from Port Canaveral to Sebastian Inlet. The northern terminus of the S.R. A1A Urban Trail is located at the southern end of the project corridor, south of George King Boulevard.

2.10.4 Physical Environment

2.10.4.1 Soils and Geotechnical Data

Based on existing soils data (see figure 2-20), the subsurface profile at the bridge site consists of loose to medium dense sands with intermittent dense sand/shell layers.

Layers of soft clay appear at varying depths and thicknesses throughout the sand profile. Very dense weathered limestone is found at a depth of about 160 feet.

Critical issues for bridge foundations include artesian groundwater (eliminates drilled shafts), extremely aggressive substructure environment in combination with a water crossing (eliminates steel piles and 18-inch concrete piles), shell layers in the subsurface profile (can lead to overestimation of pile capacity), a deep limestone bearing layer (pile splices may be required to achieve high pile capacities), channel scour and protection of the current bridges from ground vibrations generated by pile driving operations. Soil borings were performed nearby to the bridge site and in general, the soil conditions at the proposed bridge may be suitable for shallow foundation support. However, the intermittent loose sand layers and shallow, very soft to firm clay layer encountered at the boring locations, may settle significantly under large shallow footing loads. Therefore, shallow foundations are not recommended to support large bridge footing loads in these conditions, especially if the bridge structure cannot tolerate moderate to differential settlements.

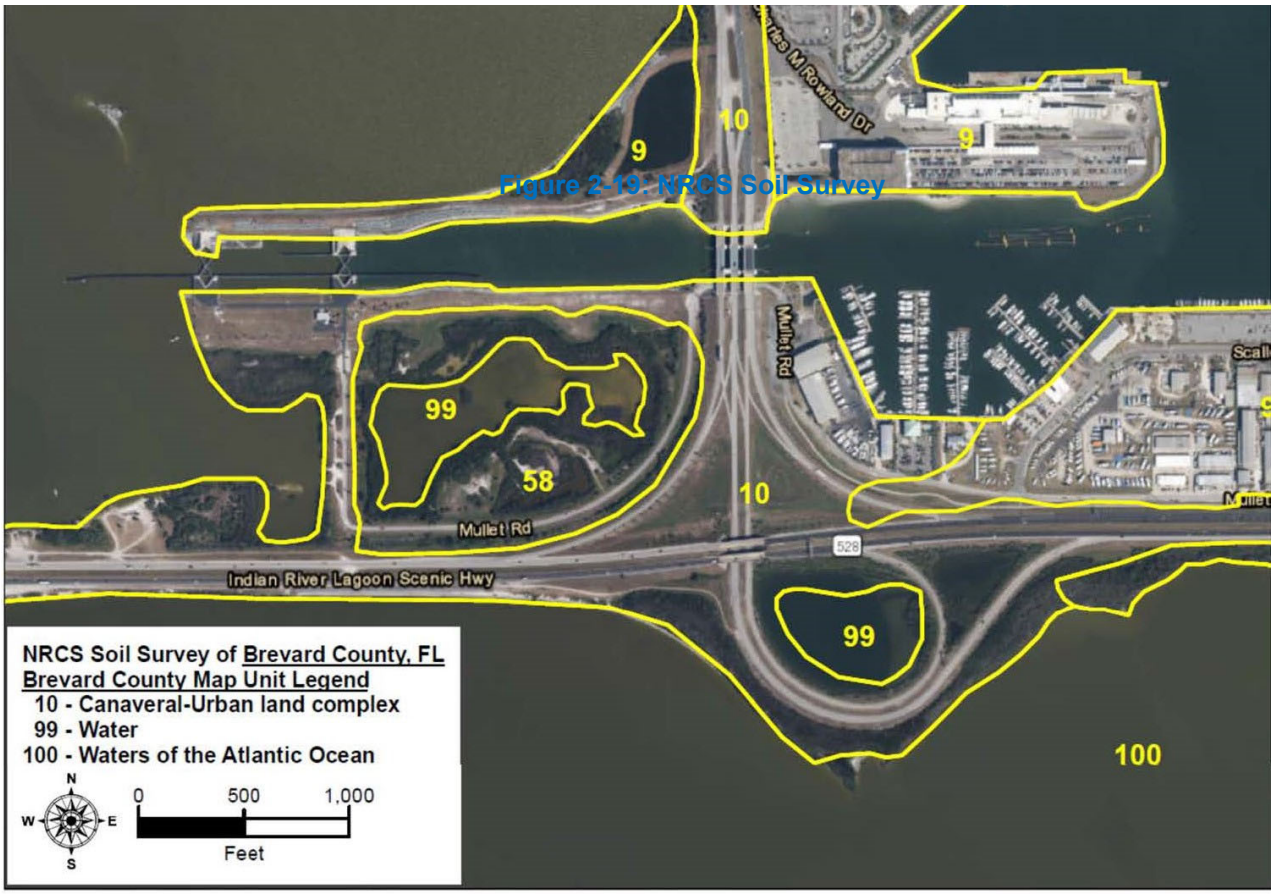


Figure 2-20: NRCS Soil Survey

Noise

A noise study was conducted for this project. Noise sensitive areas were identified at Rodney Ketchum Park and a local marina with some live-board tenants.

2.10.5 Waterway Vessel Survey

A marine vessel navigation study and survey were conducted for this study. The details and findings are documented in the Vessel Survey and Navigation Study dated October 7, 2021, and revised April 2022. This study provides critical information in the determination of the bridge replacement option by evaluating the optimal type and height of the bridge. This is a function of the air draft of vessels that will utilize the waterway and their frequency of use today and in the future. The analysis is based on data collected from the market to establish drawbridge utilization as well as the timing of the peak months of marine traffic that may coincide with vehicular traffic. The results of the report guided the development of the solutions for the S.R. 401 bridge recommendation.

Unlike the Intracoastal Waterway (ICWW), where marine traffic and bridge height standards are commonplace, this waterway is the only inlet within an 80-mile stretch providing access

to Central Florida from the Atlantic Ocean. Ponce de Leon Inlet is 50 miles to the north and Sebastian Inlet is 30 miles to the south. As a result, the marine traffic characteristics are unique. This is reflected by the different marine traffic categories that were identified as using the Canaveral Barge Canal. This includes the typical recreational boater, but the canal also serves commercial traffic, boat manufacturers located inland along the canal, and traffic associated with the space program.

The survey was completed in April 2022 and found that the bridge opening times amounted to over 130 hours of annual delay. This equates to approximately six openings a day in the existing condition.

2.10.6 Contamination

A Level 1 Contamination Screening Evaluation was conducted for this study in accordance with the FDOT PD&E Manual, Part 2 Chapter 20. As part of this evaluation, a preliminary review of potential contamination sites located within the search distances for the project alignment was conducted. We identified the following listings: five petroleum tank facilities and one hazardous material generator. No contamination issues were identified that would have a substantial impact on the project (see figure 2-21).

Figure 2-21: Potentially Contaminated Sites

3. PROJECT DESIGN CONTROLS AND CRITERIA

3.1 Design Controls and Criteria

Table 3-1 lists design controls and criteria and associated manuals, procedures and guidelines used to develop the alternatives.

Table 3-1: Design Controls and Criteria		
General		
Design Element	**Design Criteria**	**Source**
Design Year	20 years (2050)	FDM 201.3 – scope of services
Design Vehicle	WB-62FL (Florida Interstate Semitrailer)	FDM 201.6
S.R. 401		
Context Classification	C3C Suburban Commercial	FDM 200.4 /Table 200.4.1
Access Classification	03, Non-Restrictive	FDM 201.4
Design speed (S.R. 401)	45 mph	FDM 201.5 / Table 202.3.1
S.R. 528 Ramps		
Design speed (ramps)	35 mph	FDM 201.5
Acceleration Lane Length	550' (35 mph to 55 mph) N/A (35 mph to 50 mph)	AASHTO Exhibit 10 -70
Deceleration Lane Length	350' (55 mph to 35 mph) 285' (50 mph to 35 mph)	AASHTO Exhibit 10 -73
Cross Section		
Design Element	**Design Criteria**	**Source**
S.R. 401		
Lane Width	11’	FDM Table 210.2.1
Bridge Lane Width	12' (3 lanes)	FDM 260.2
Median Width	22'	FDM Table 210.3.1
Shoulder Width (with Gutter)	15.5' (8' paved) Right and Left	FDM Table 211.4.1
Shoulder Width (without Gutter)	12' (10' paved) Right and Left	
Bridge Shoulders	10' (left and right)	FDM Figure 260.1.1
Cross Slopes (Shoulders)	0.05 ft/ft (inside Northbound and Southbound) shoulders 0.06 ft/ft (outside Northbound) shoulders 0.05 ft/ft (outside Southbound) shoulders	FDM Figure 210.4.2
Cross Slopes	0.02 ft/ft (inside and outside)	FDM Figure 210.4.2
Bridge Cross Slopes	0.02 ft/ft	FDM 260.4
Stopping Sight Distance	400' Downgrade and 331' Upgrade	FDM Table 210.11.1

Table 3-1: Design Controls and Criteria		
S.R. 528 Ramps		
Lane Width	15' (single) 24' (double)	FDM 211.2.1
Shoulder Width (1 lane)	6' (4' paved) right 6' (2' paved) left	FDM Table 211.4.1
Shoulder Width (2 lane)	10' (8' paved) right 8' (4' paved) left	
Cross Slope	0.02 ft/ft (single and double lane)	FDM Figure 211.4.1/Figure 210.2.1
Stopping Sight Distance	261' Downgrade and 234' Upgrade	FDM Table 211.10.2
Horizontal Alignment		
Design Element	**Design Criteria**	**Source**
S.R 401		
Maximum Deflections	0° 45' 00"	FDM 210.8.1
Maximum Curvature	10° 15' 00" / 559' (radius)	FDM Table 210.9.1/Table 210.8.2
Maximum Super Elevation	0.10 ft/ft	FDM 210.9/ Table 210.9.1
Length of Horizontal Curve	675' desirable (400' min)	FDM Table 210.8.1
Horizontal Clearance	10'	FDM 260.8.2
S.R. 528 Ramp		
Length of Horizontal Curve	525' desirable (400' min)	FDM Table 211.7.1
Maximum Curvature	17° 45' 00" and 323' (radius)	FDM Table 210.9.1/Table 210.8.2
Super Elevation Distribution (tangent/curve)	80/20 desired (50/50 min)	FDM 210.9.1
Superelevation Transition Slope Rates	1:175	FDM Table 210.9.3
Maximum Deflections	2° 00' 00"	FDM 210.8.1
Maximum Super Elevation	0.05 ft/ft	FDM 210.9/ Table 210.9.1
Vertical Alignment		
Design Element	**Design Criteria**	**Source**
S.R. 401		
Maximum Grades	4% max for truck traffic > 10%	FDM Table 210.10.1
Bridge Max. Grade	6%	FDM Table 210.10.1

Table 3-1: Design Controls and Criteria		
Maximum Change in Grade Without Vertical Curve	0.70%	FDM Table 210.10.2
Minimum K for Sag Vertical Curves	79	FDM Table 210.10.3
Minimum K for Crest Vertical Curves	98	FDM Table 210.10.3
Minimum Vertical Curve Length	135' (Sag and Crest)	FDM Table 210.10.4
Vertical Clearance	16.5' (min over S.R. 528) 6' (above mean high water) 2' (above design flood state)	FDM 260.6.1/260.8.1
S.R. 528 Ramp		
Maximum Grades	4%	FDM Table 211.9.1
Maximum Change in Grade Without Vertical Curve	0.90%	FDM Table 210.10.2
Minimum K for Sag Vertical Curves	49	FDM Table 211.9.2
Minimum K for Crest Vertical Curves	47	FDM Table 211.9.2
Minimum Vertical Curve Length	105' (Sag and Crest)	FDM Table 111.9.3

Reference: FDOT Design Manual (FDM), 2022

AASHTO – A Policy on Geometric Design of Highways and Streets, 7th Edition, 2018

4. ALTERNATIVES ANALYSIS

4.1 Previous Planning Studies

S.R. 401 Bridge Alternatives Evaluation, FDOT District Five, March 2017

The S.R. 401 Bridge Alternatives Evaluation was reviewed and used as reference materials for the S.R. 401 Bridge Replacement PD&E Study. The S.R. 401 Bridge Alternatives Evaluation included a brief introduction, location map, traffic forecast approach, data collection, traffic analysis, cost estimates, summary, and attachments.

The purpose of this evaluation was to develop cost estimates for three options to replace the existing bascule bridges in order to address current design standards as well as estimate future growth within the immediate area requiring access to the north side of the port. The three options considered included:

Option 1: Retrofit the Existing Bascule Bridges
Option 2: Mid-Level Bascule Bridge Replacement
Option 3: High-Level Fixed Bridge Replacement

Summarizing the results of the S.R. 401 Bridge Alternatives Evaluation was the identification of three options, recommending that due to the close proximity of the S.R. 528 ramps, six (6) lanes be constructed (three (3) lanes in each direction). In addition, the sidewalks are recommended to address the observed pedestrian use of the existing bridges.

The S.R. 401 Bridge Replacement PD&E Study reviewed, updated, and utilized: a) The Port Area Traffic Forecast, b) Existing Conditions Information, c) Traffic Data Collection and Analysis, and d) Future Growth Development from the S.R. 401 Bridge Alternatives Evaluation. Our study also reviewed the three options and Option 1 (Retrofit the Existing Bascule Bridges) was eliminated by the FDOT, and a No-Build option was added. The S.R. 401 Bridge Replacement PD&E Study also continued with the following recommended steps from the previous study: 1) Prepare a navigational study, b) Prepare a sea-level analysis, c) Update traffic conditions and crash analysis, and d) Continued stakeholder coordination.

4.2 No Build (No Action) Alternative

The No Build Alternative consists of leaving the existing bascule bridges, pictured below, in place (see figure 4-1). The existing bridges will continue to provide a 25-foot vertical clearance (mean high water) in the closed position and a horizontal clearance of 90 feet at the main navigational channel.

Bridge inspection reports prepared by the Florida Department of Transportation (FDOT) have classified the S.R. 401 bascule bridges at Port Canaveral as functionally obsolete due to not meeting current FDOT bridge design standards. The southbound bridge was

constructed in 1963 and the northbound bridge was constructed in 1972; both bridges are due for an update. A 2011 Spaceport Area infrastructure assessment study identified the S.R. 401 bridge as critically important and that the current bridge "weight limits and insufficient capacity can inhibit economic growth" of the region. The No-Build Alternative does not address the purpose & need for the project and will not improve operational flows.

A review of the adopted FY 2023 – 2027 TIP (Space Coast TPO), identified the following projects programmed in the area:

- S.R. A1A - Minuteman Causeway to S.R. 401, ITS
- S.R. A1A – Long Point Rd. to George King Blvd., Bike/Ped
- S.R. 401 – S.R. 528 to Canaveral Space Force Station, Resurfacing
- S.R. 401 over Canaveral Barge Canal, Bridge-Repair/Reh.

A Repair/rehabilitation alternative was not given any consideration as a viable alternative since the existing bridges have been classified as functionally obsolete, having weight limit restrictions and will does not address future traffic volume capacity needs that support expanding port freight operations and maximizing military uses. The service life of the existing bridges is 75-years, Bridge Nos. 700030 and 700031 were built in 1963 while Bridge No. 700117 was built in 1963. Therefore, based on this information, a Repair/Rehabilitation alternatives was not considered a cost-effective option and was not considered.

TSM&O strategies will preserve capacity and improve security, safety, and reliability of the S.R. 401 corridor. The strategies will include CCTV coverage along the entire corridor and interchange, existing DMS signs will be replaced with full color 20 MM pixel DMS and fiber will be deployed throughout the proposed interchange. There will be a fiber demarcation point that will allow the Port Authority to connect to the network in order to have access to the camera views. A Vehicle Detection System (VDS) will be provided to collect speed, occupancy, and volume traffic data along the ramps to evaluate the traffic entering and exiting the Port. However, TSM&O strategies alone will not resolve the congestion issues along the corridor caused by the existing bridge openings, thereby, not meeting the purpose and need for the project.

Figure 4-1: Existing S.R. 401 Bascule Bridges (No Build Alternative)

4.3 Future Traffic Analysis of Alternatives

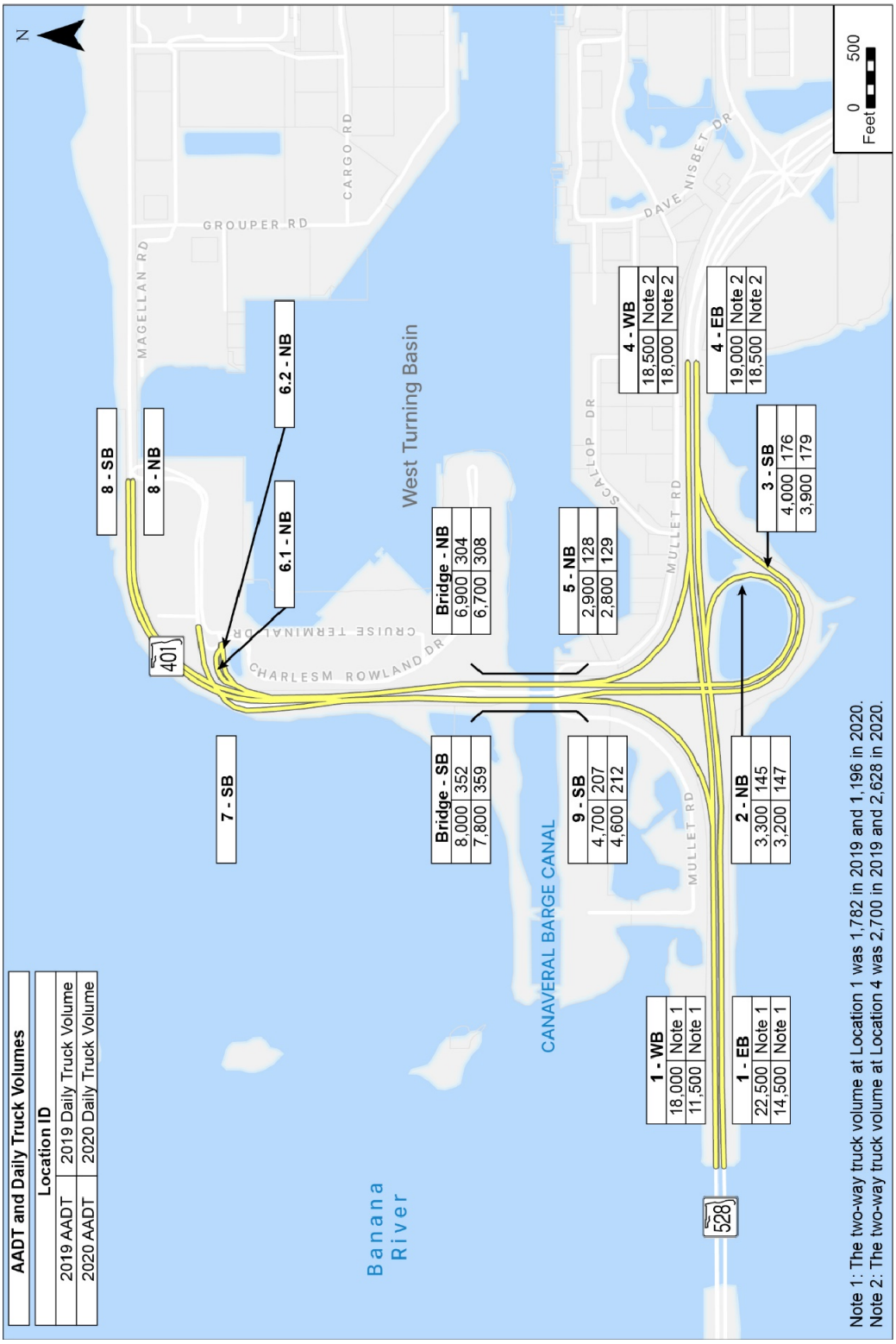
4.3.1 Future Traffic Volumes

The final weekday daily and peak hour volumes and truck percentages for the 2019 base year and 2030 and 2050 horizon years are illustrated (see figures 4-2 through figure 4-6) for the Recommended Alternative only, the High-Level Fixed Bridge. Table 4-1 reports the compound annual growth rates (CAGR) at the S.R. 401 bridge and on S.R. 528 on each side of the S.R. 401 interchange. The CAGR are higher on the S.R. 401 bridge than on S.R. 528 because the base year volumes across the S.R. 401 bridge are lower than on S.R. 528.The forecast Port North trips across the bridge has a greater impact on the growth calculation, and because that growth is spread between either side of S.R. 528 at the S.R. 401 interchange, the growth on S.R. 528 is somewhat diluted. That the 2030 CAGR is greater than the 2050 CAGR at the S.R. 401 bridge reflects the relatively sudden jump to a four-active berth weekday scenario by 2030 and with it, the sudden increase in cruise passengers. The growth in Port North-based trips between 2030 and 2050 results from additional cruise passengers by virtue of larger ships and an increase in cargo truck traffic. But these increases are not as impactful viewed over the additional twenty years.

Table 4-1: CAGR in Weekday Volume (2030 Opening Year and 2050 Design Year)*

Scenario	S.R. 401 Bridge		S.R. 528 West of S.R. 401		S.R. 528 East of S.R. 401	
	Northbound	Southbound	EB	WB	EB	WB
2030 – 4 Ship	5.2%	5.8%	1.6%	1.7%	1.3%	1.5%
2050 – 4 Ship	2.5%	2.7%	1.0%	1.1%	0.9%	0.9%

*Opening and Design Years per scope of services



Source: FDOT 2019 and 2020 Annual Average Daily Traffic Reports (Florida Traffic Online)

Figure 4-2: Available Recent (2019 and 2020) AADT in Study Area

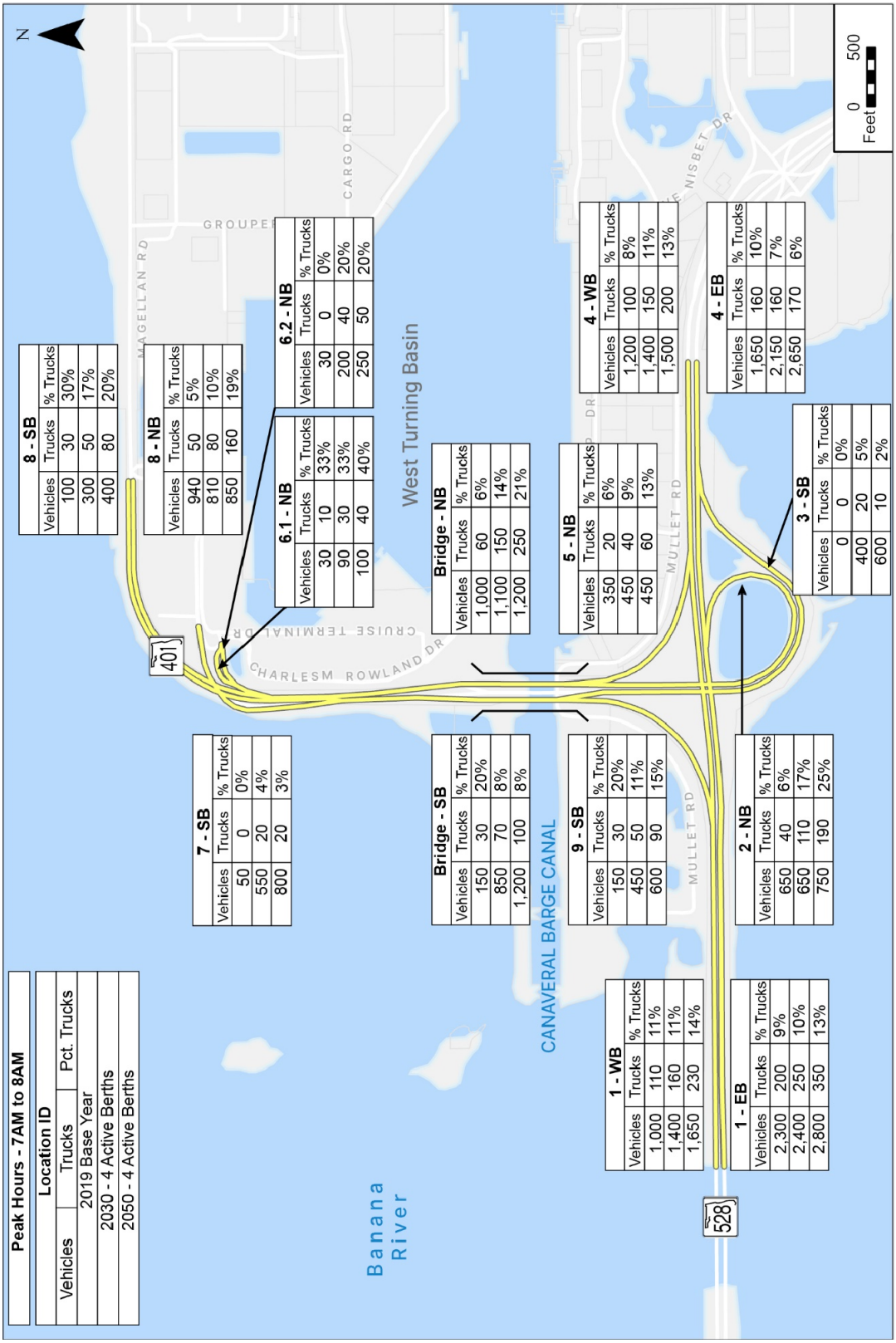


Figure 4-3: Recommended Alternative Weekend Daily Volumes

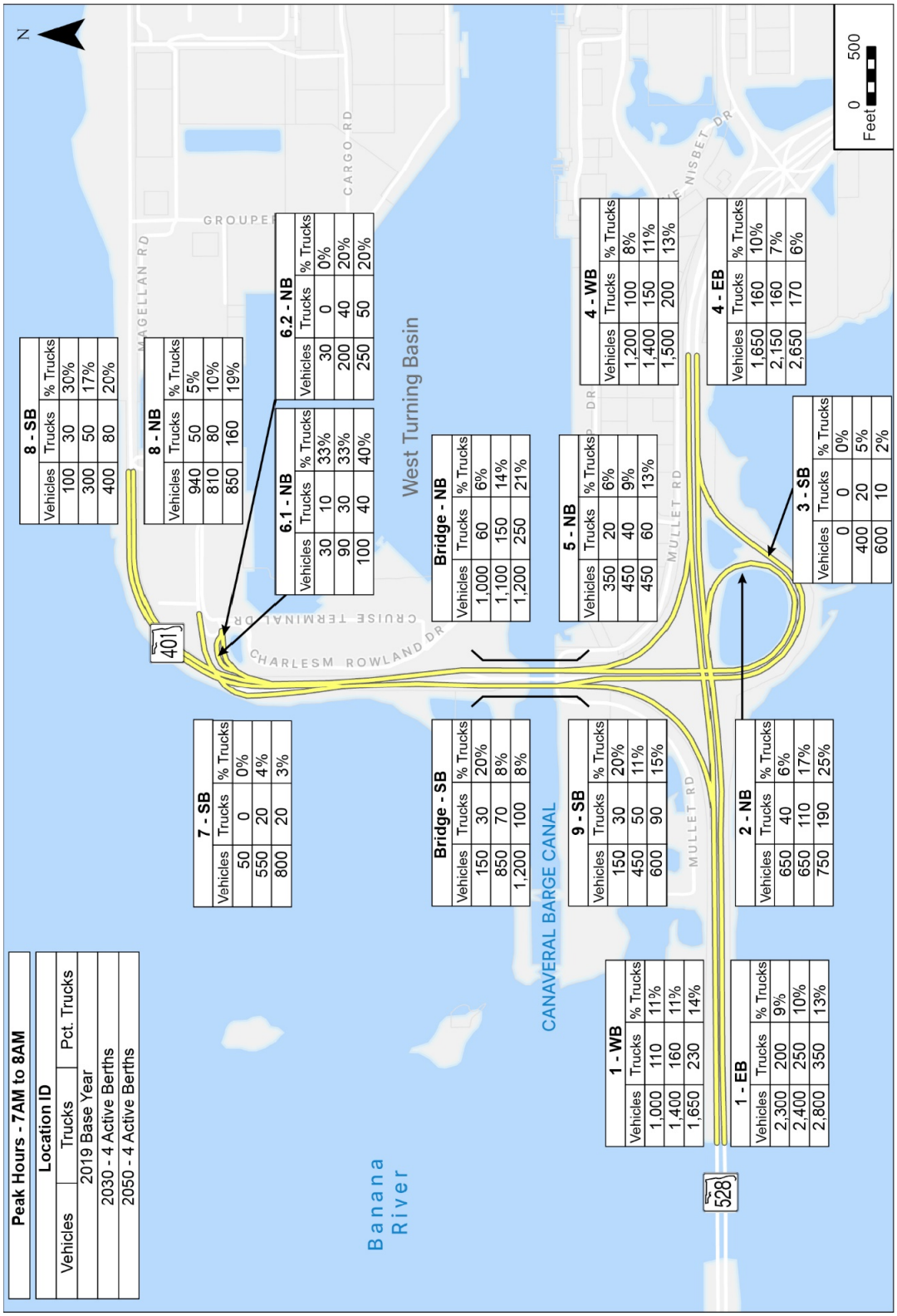


Figure 4-4: Recommended Alternative AM Peak Hour Volumes

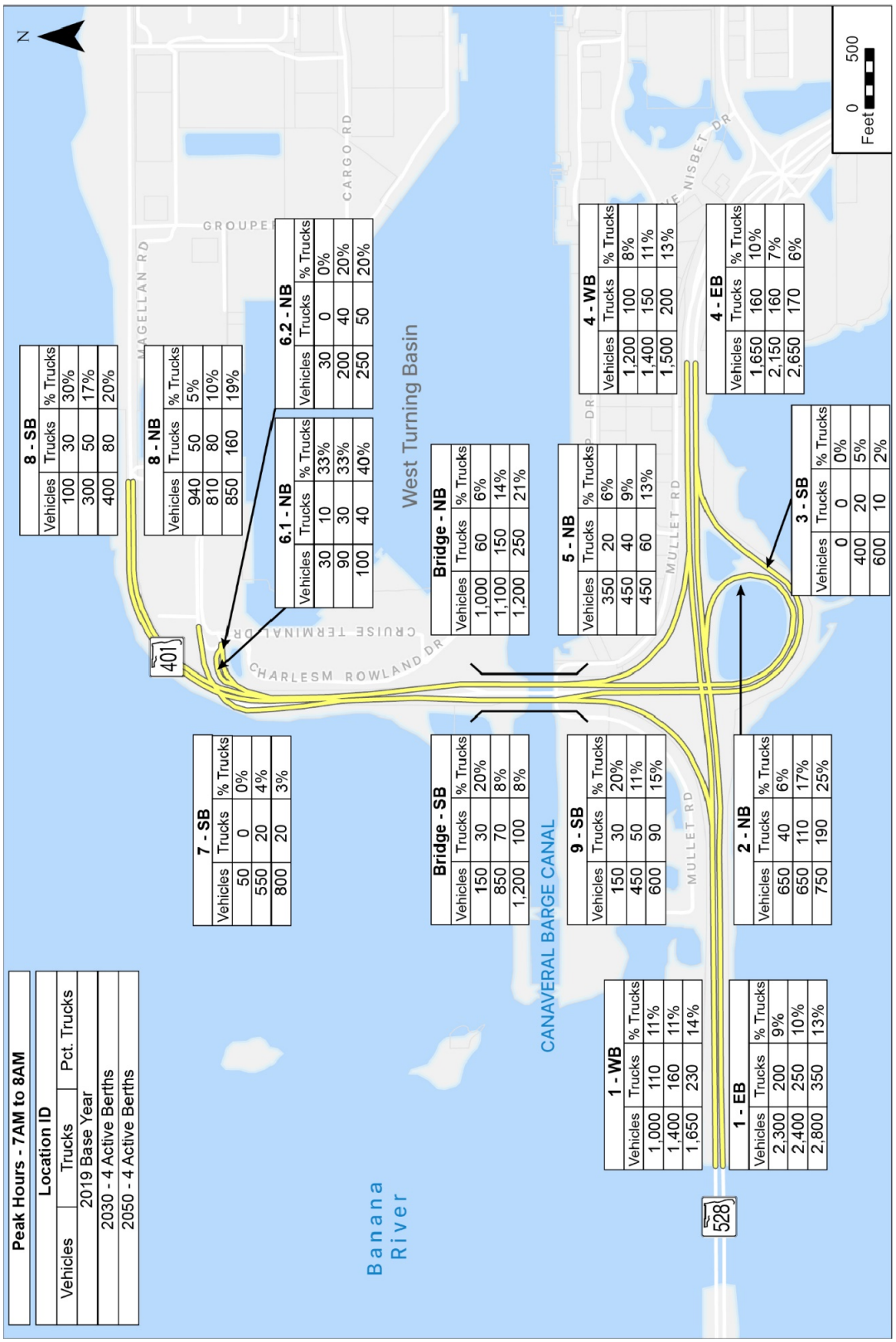


Figure 4-5: Recommended Alternative Midday Peak Hour Volumes

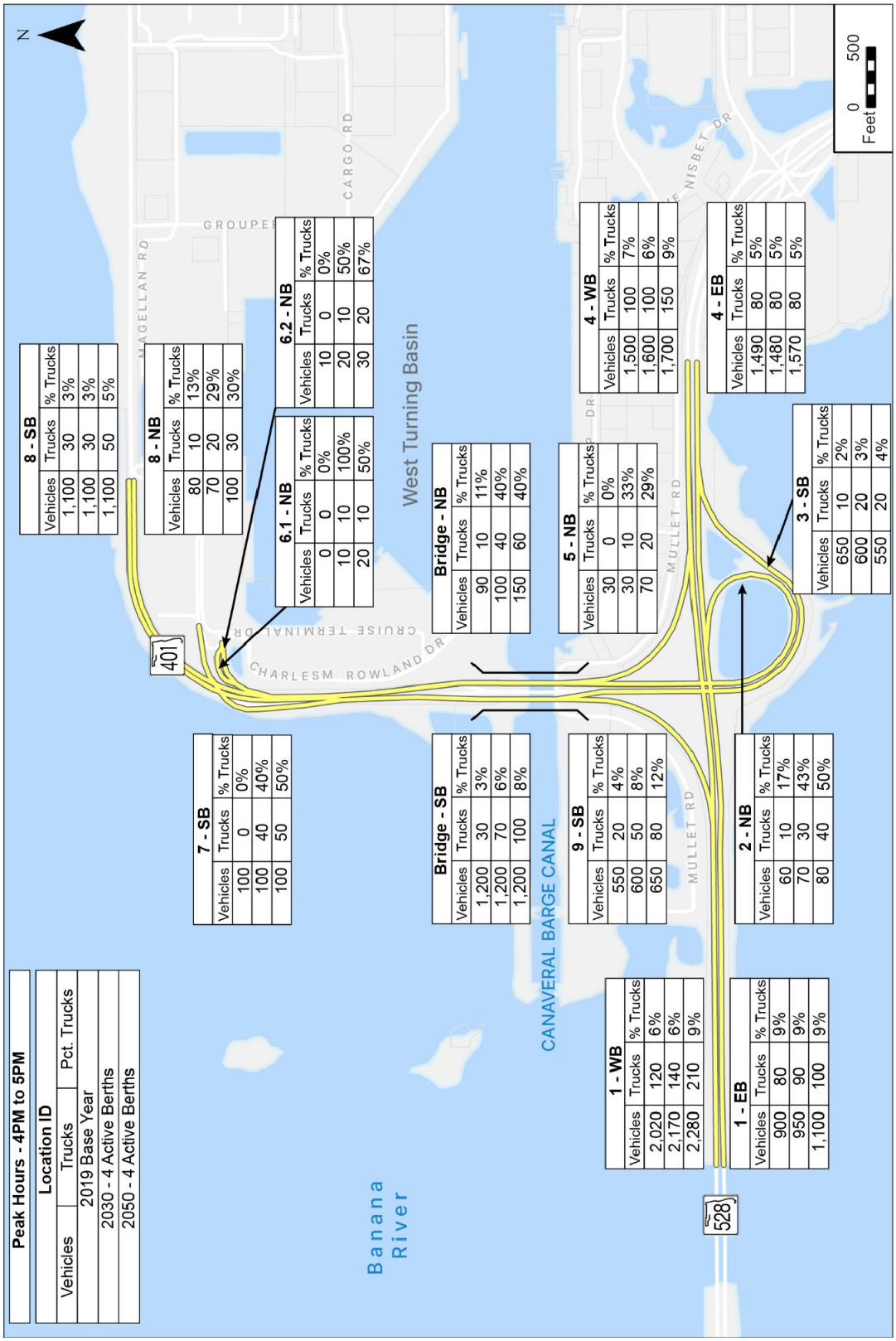


Figure 4-6: Recommended Alternative PM Peak Hour Volumes

4.3.2 Safety Analysis

Analysis of the different bridge alternatives revealed that the fixed bridge will yield a crash reduction of 1.38 crashes per year, and the lift bridge and new drawbridge will yield 1.102 reduced crashes each per year. Based on the results of the Project Traffic Analysis Report (PTAR) (see PTAR, page 9-1), the High-Level Fixed Bridge Alternative will yield the greatest number of crash reductions per year.

4.4 Alternatives Considered but Eliminated from Detailed Study

In addition to the three alternatives discussed in the 2017 Planning study (see Section 4.1) two additional alternatives were considered during the analysis process but eliminated from detailed study. These alternatives included a High-Level Bascule/Drawbridge Alternative and an Immersed Tube Tunnel Alternative.

4.4.1 High-Level Bascule/Drawbridge Alternative

The High-Level Bascule/Drawbridge Alternative would replace the existing three bascule bridges with two, separate three-lane bascule bridges. Similar to the High-Level Fixed Bridge Alternative, this improvement would provide a closed span maximum 65-foot vertical clearance above mean high water and a 90-foot horizontal clearance at the navigation channel. The benefit of this alternative when compared to the three alternatives that are moving forward would be to provide additional marine navigational capabilities for vessels exceeding a 65-foot mast height. However these additional vessels are anticipated to account for less than 1 percent of the total vessel traffic[1].

The maximum grade will be 6% which will require a design variation. The total bridge length would be approximately 4,150 feet, which does not include the additional 900 feet of S.R. 528 ramps that are bifurcating from the northbound and southbound S.R. 401 bridges.

In comparison with the High-Level Fixed Bridge Alternative, this alternative would require a southerly shift in the profile to center the vertical alignment over the navigation channel in order to provide a flatter approach grade at the bascule spans. This southerly shift would require the approach vertical alignment to be raised in both the northbound and southbound directions. Raising the approach vertical alignment would impact the S.R. 528 Interchange to the south, but the vertical alignment touchdown does not impact the parking garage ramps to the north. Figure 4-7 shows these impacts. Similar to the Mid-Level Bascule/Drawbridge, a section of Mullet Road that runs under the bridge must be shifted to the south to accommodate the new drawbridge bascule piers.

[1] Table 1: Vessel Survey & Navigation Study – Final 65-foot Fixed Bridge Concern Mitigation Memo, 2022

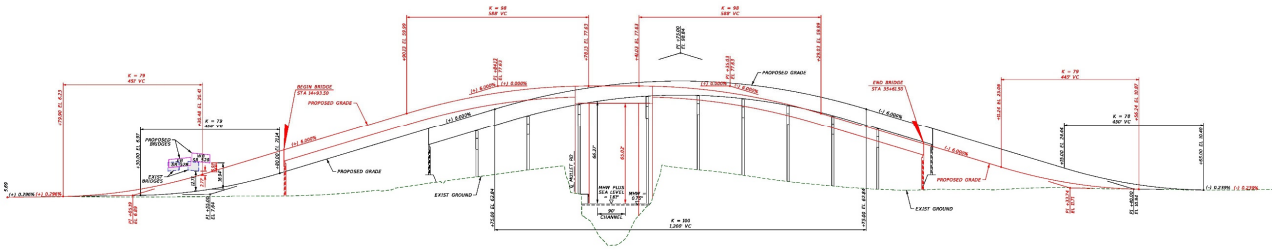


Figure 4-7: High-Level Bascule Bridge Alternative Profile

The increased vertical geometry and associated impacts to the adjacent S.R. 528 Interchange combined with the construction of piers that are structurally sufficient to support the mechanical components of a bascule bridge would result in the estimated construction costs of approximately $226 million and life-cycle operations and maintenance cost of $47 million. The total estimated cost for this alternative is approximately $273 million which is $143 million more than the estimated total project cost for the High-Level Fixed Bridge Alternative which is $130 million.

The social, natural and physical impacts of the High-Level Bascule/Drawbridge Alternative would be similar to the High-Level Fixed Bridge Alternative.

The substantial disadvantages of the High-Level Bascule/Drawbridge Alternative are the following.

- The anticipated total project costs are almost double the anticipated costs of the preferred alternative.
- The alternative would not address the traffic delays associated with both marine vessel traffic and maintenance cycles
- The alternative would require additional utility impacts due to the size and location of the bascule piers necessary to support the bascule operating machinery and conflicts with the nearby overhead power lines with the additional approach spans on the south end of the project.

Due to the substantial disadvantages and minor benefits when compared to other viable alternatives, the High-Level Bascule/Drawbridge Alternative was eliminated from any further detailed analysis.

4.4.2 Immersed Tube Tunnel (ITT) Alternative

The Immersed Tube Tunnel (ITT) Alternative would replace the existing three bascule bridges with two separate three-lane parallel tunnels. The benefit of this alternative when compared to the three alternatives that are moving forward would be to provide additional marine navigational capabilities for vessels exceeding a 65-foot mast height. However these additional vessels are anticipated to account for less than 1 percent of the total vessel traffic. (See note1 on page 4-10).

The tunnels are designed to provide a 20-foot channel depth below low water. The exterior of the tunnel is 74 feet wide and 34 feet in height. In addition, gravel bedding, a 2-foot-tall filter and 5-foot rock armor with anchor release protection would result in a top of roadway profile of 32 feet below the 20-foot channel depth. The tunnel grade would be designed with a 6% vertical grade and would result in a total length of approximately 2,020 feet including approximately 1,120 feet of immersed tunnel.

The design of the tunnel would include a vehicle dynamic envelope of 16'-6'' of vertical clearance. The design includes a pressurized side emergency evacuation corridor and overhead utilidor. Ventilation for air quality and fire emergency will be employing jet fans supported overhead with sound attenuators. There may be modifications to the first tunnel for cross ventilation exhaust for fire protection because of the two-way traffic period during the construction phasing operations. Low point pumping station and the portal pump stations remove rainwater from the open approaches. The primary cause of pump volume is related to fire protection. The firefighting water tunnel system and fire truck pumpers use potable water. There is the probability that the used fire water will have roadway or accident spilled oil or chemicals as could happen on any surface roadway. The pumped-out water is treated before discharge into the waterway. This would be designed particularly considering the native wildlife. The immersed tube tunnel elements (sections) are generally built in ship graving docks and towed to the site for final outfitting and lowering into the dredged excavation. Because of the draft of these sections, there would need to be access dredging below the existing 20-foot channel to deliver the elements to the site. The marine work would require coordination with vessel traffic and Port Canaveral.

An initial preliminary construction cost for the ITT alternative is an order of magnitude of $880 million and life-cycle operations and maintenance cost of $370 million. In ITT design there are critical individual site conditions that control design decisions resulting in substantial differences in cost. An example is whether the elements are built in an existing graving dock or at a developed site for the project. As there are no graving dock facilities in the Port of Canaveral, the ITT sections will have to be towed in by sea to the project site which substantially increases cost. The preliminary cost for this alternative is approximately $1.25 billion which is $1.12 billion more than the estimated total project costs for the High-Level Fixed Bridge Alternative which is $130 million dollars.

The social, natural, and physical impacts of the ITT alternative are anticipated to be substantially greater than the three alternatives that are moving forward. Additional impacts to saltwater marsh, tidal flats, and mangroves wetlands would be anticipated on the east and west sides of the project corridor. Due to dredging requirements, impacts to EFH would be expected to occur which would be an increase over the Preferred High-Level Fixed Bridge Alternative, and will require consultation with the National Marine Fisheries Service (NMFS). Additionally, adverse impacts to protected species would be anticipated with the Immersed Tube Tunnel Alternative such as swimming sea turtles, Florida manatee, giant manta ray,

and smalltooth sawfish, requiring formal Section 7 consultation with U.S. Fish and Wildlife Service (USFWS) and NMFS. Additional potential impacts associated with the Tunnel Alternative include disposal of sediment (if not contaminated) to an offshore disposal site, water quality concerns, turbidity, impact to the Banana River Aquatic Preserve, and challenges associated with environmental permitting.

The substantial disadvantages of the ITT Alternative are the following.

- The anticipated total project costs are almost 10 times the anticipated costs of the preferred alternative.
- The alternative would result in substantially more environmental impacts during construction.
- The alternative would result in extended interruptions of marine traffic during construction.

Due to the substantial disadvantages and minor benefits when compared to other viable alternatives, the ITT Alternative was eliminated from detailed analysis.

In summary, both alternatives were evaluated from a cost, environmental, and operational perspective. The ITT Alternative was dropped from further evaluation due to environmental impacts during construction, extended impacts to the marine traffic during construction, extremely high initial construction costs, and high long-term maintenance costs. Similarly, the High-Level Bascule/Drawbridge Alternative was dropped from further evaluation due to high maintenance cost due to machinery located in a very corrosive environment, additional utility impacts, due to the additional approach spans on the south end of the project, high construction costs, and impacts to the adjacent S.R. 528 Interchange.

4.5 Build Alternatives

4.5.1 High-Level Fixed Bridge Alternative

The High-Level Fixed Bridge Alternative considers replacing the existing three bascule bridges with two separate three-lane high-level, fixed span concrete bridges located on the existing bridge alignment, (see figures 4-8 and 4-9). This improvement would provide a maximum 65-foot vertical clearance above mean high water and a 90-foot horizontal clearance at the main navigational channel. The total bridge length would be 3,210 feet. The maximum grade of 6% and design speed of 45 mph would require a design variation. A design variation is needed when the profile grades exceeds the 4% max grade called for in the 2022 FDM, and when the truck traffic is 10% or more. The high-level bridge would result in no bridge openings thereby eliminating existing delays.

Some embankment is required for the S.R. 528 ramps because the proposed bridge is higher than the existing bridge, but the S.R. 401 roadway and the ramps at S.R. 528 will be on the same alignment as the existing condition. A section of Mullet Road that runs under the S.R. 401 bridges may be temporarily closed during construction, in which case, alternate access to the Canaveral Lock would be provided. A temporary construction connection to access the locks, perpendicular to S.R. 528, may be provided during Mullet Rd closures.

Figure 4-8: High-Level Fixed Bridge Alternative Rendering

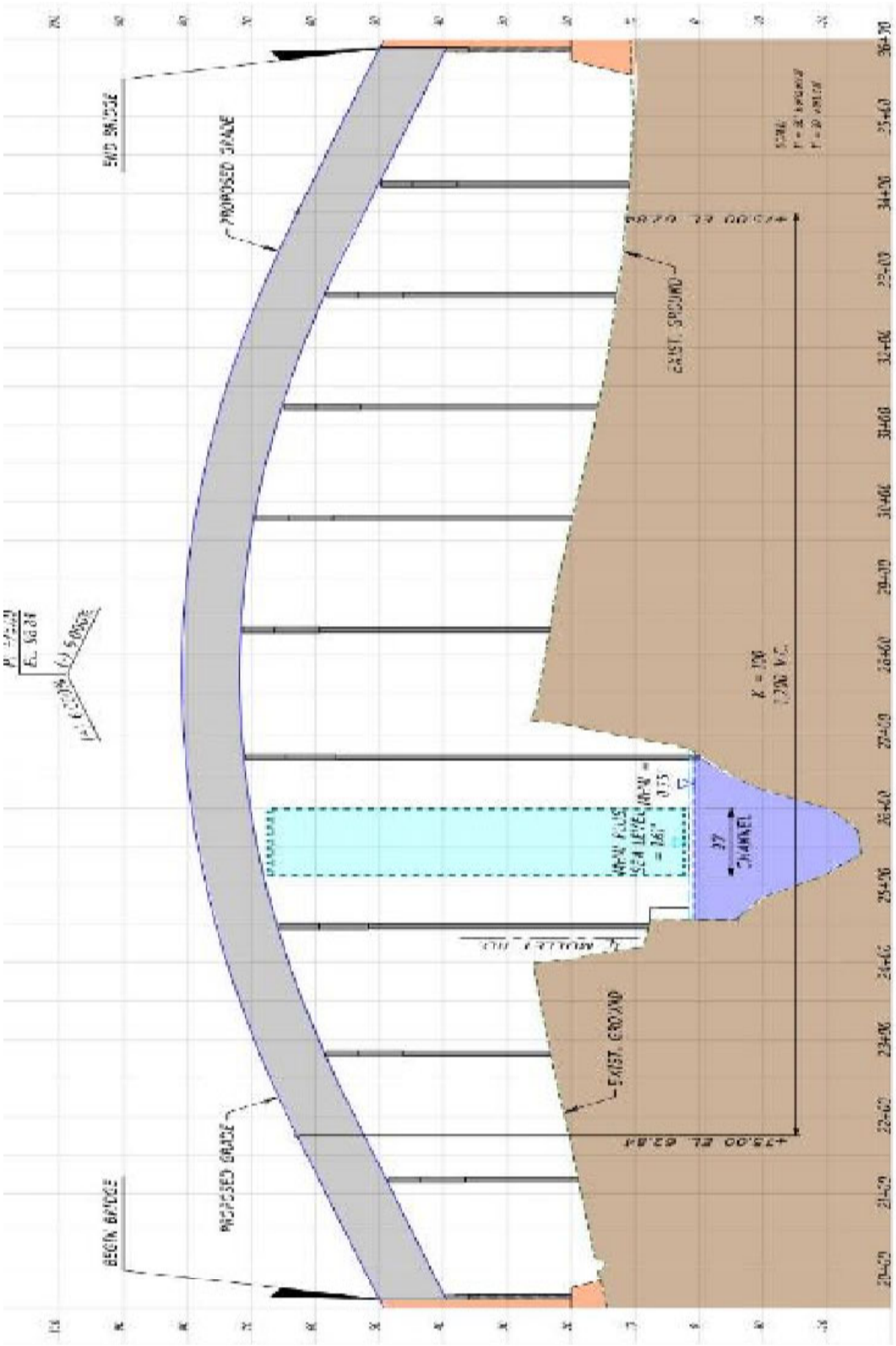


Figure 4-9: Fixed Bridge Alternative Profile

4.5.2 Mid-Level Lift Bridge Alternative

The Mid-Level Lift Bridge Alternative considers replacing the existing three bascule bridges with two separate three-lane lift bridges, located on the existing bridge alignment. A vertical lift bridge span, which can open/close faster than a bascule bridge, rises vertically while remaining parallel with the deck, whereas a bascule bridge operates with a counterweight that continuously balances a span throughout its upward swing.

This alternative would provide a mid-level profile allowing for a 40-foot vertical clearance in the closed position and an 85+-foot clearance in the open position due to the existing FP&L lines to the west. The existing horizontal clearance is a 90-foot main navigational channel. The total bridge length is 964 feet, and the maximum grade is 4%.

This alternative would reduce the number of annual bridge openings by approximately 75% from 1,296 (current) to 312 (future years), and the annual traffic delays are projected to be reduced from about 138 hours (current year) to roughly 33 hours (future years).

For the lift bridge alternative, S.R. 401 will tie into the existing S.R. 528 interchange ramps on the south and the existing roadway on the north. Some embankment is required for the S.R. 528 ramps because the proposed bridge is higher than the existing bridge, but the roadway and ramps are on the same alignment. A section of Mullet Road that runs under the S.R. 401 bridges may be temporarily closed during construction, in which case, alternate access to the Canaveral Lock would be provided. A temporary construction connection to access the lock, perpendicular to S.R. 528, may be provided during Mullet Road closures (see figures 4-10 and 4-11).

Figure 4-10: Lift Bridge Alternative Rendering

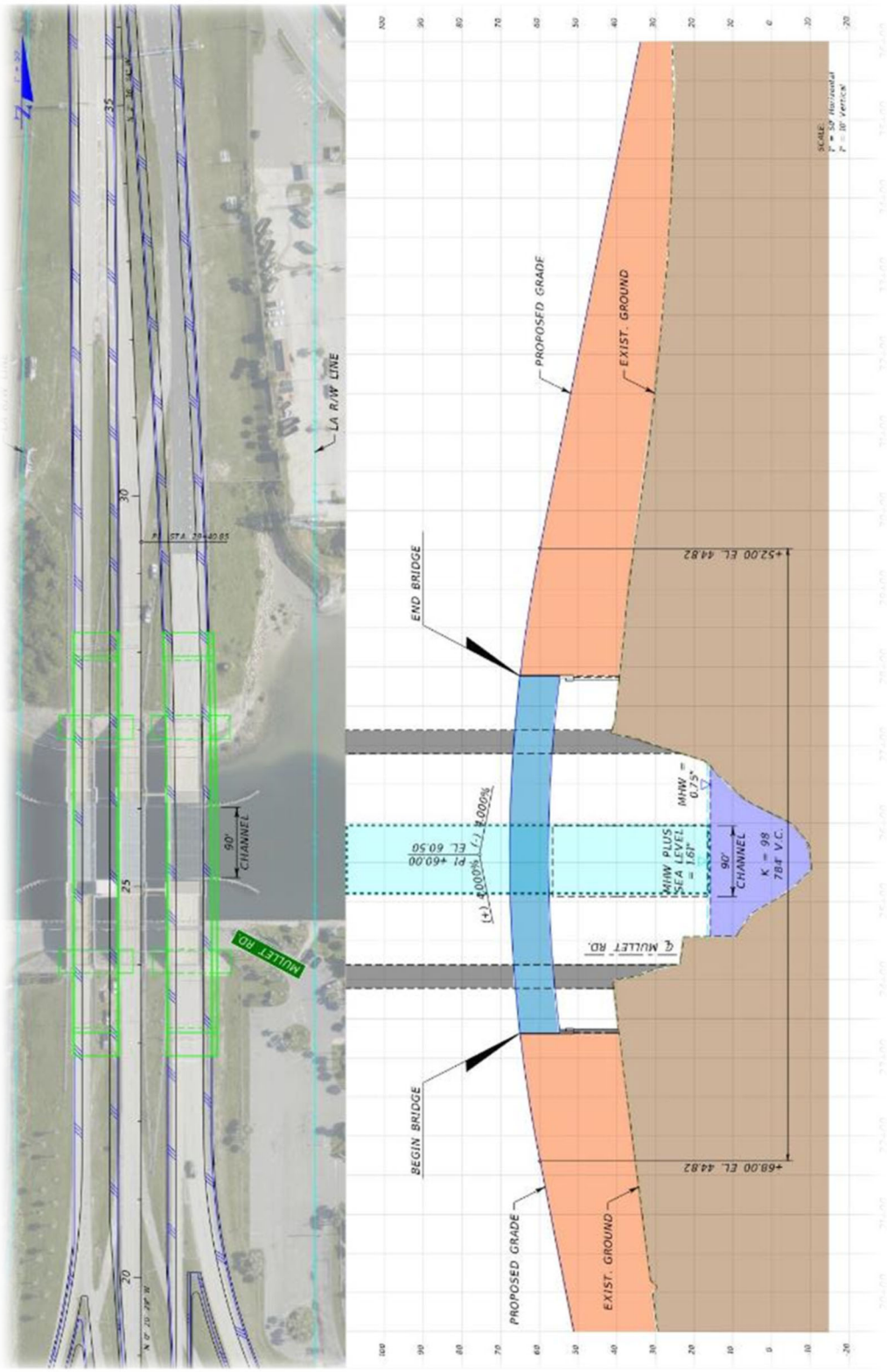


Figure 4-11: Lift Bridge Alternative Profile

4.5.3 Mid-Level Bascule/Drawbridge Alternative

This Alternative considers replacing the existing three bascule bridges with two separate three-lane bascule bridges, located along the existing bridge alignment. This alternative would provide a mid-level profile allowing for a 40-foot vertical clearance in the closed position and an unlimited clearance in the open position.

The existing horizontal clearance is a 90-foot main navigational channel. The total bridge length is 1,114 feet, and the maximum grade is 4%. The existing bascule bridges are classified as functionally obsolete, and this alternative would address that issue. This alternative would address the number of annual bridge openings that are projected to be reduce approximately 75% from 1,296 (current) to 312 (future years), and the annual traffic delays are projected to be reduced from about 138 hours (current year) to roughly 33 hours (future years).

Like the High-Level and Lift Bridge Alternative, the drawbridge alternative will tie into the existing roadway and S.R. 528 interchange ramps, therefore, some embankment will be required to tie S.R. 401 into the S.R. 528 interchange because proposed bridge is higher than the existing bridge, but S.R. 401 roadway and the ramps at S.R. 528 will be on the same alignment as the existing condition. For this alternative, a section of Mullet Road that runs under the bridge must be shifted to the south to accommodate the new drawbridge abutments. A temporary construction connection to the lock, perpendicular to S.R. 528, may be provided during Mullet Rd closures (see figures 4-12 and 4-13).

Figure 4-12: Mid-Level Bascule/Drawbridge Alternative Rendering

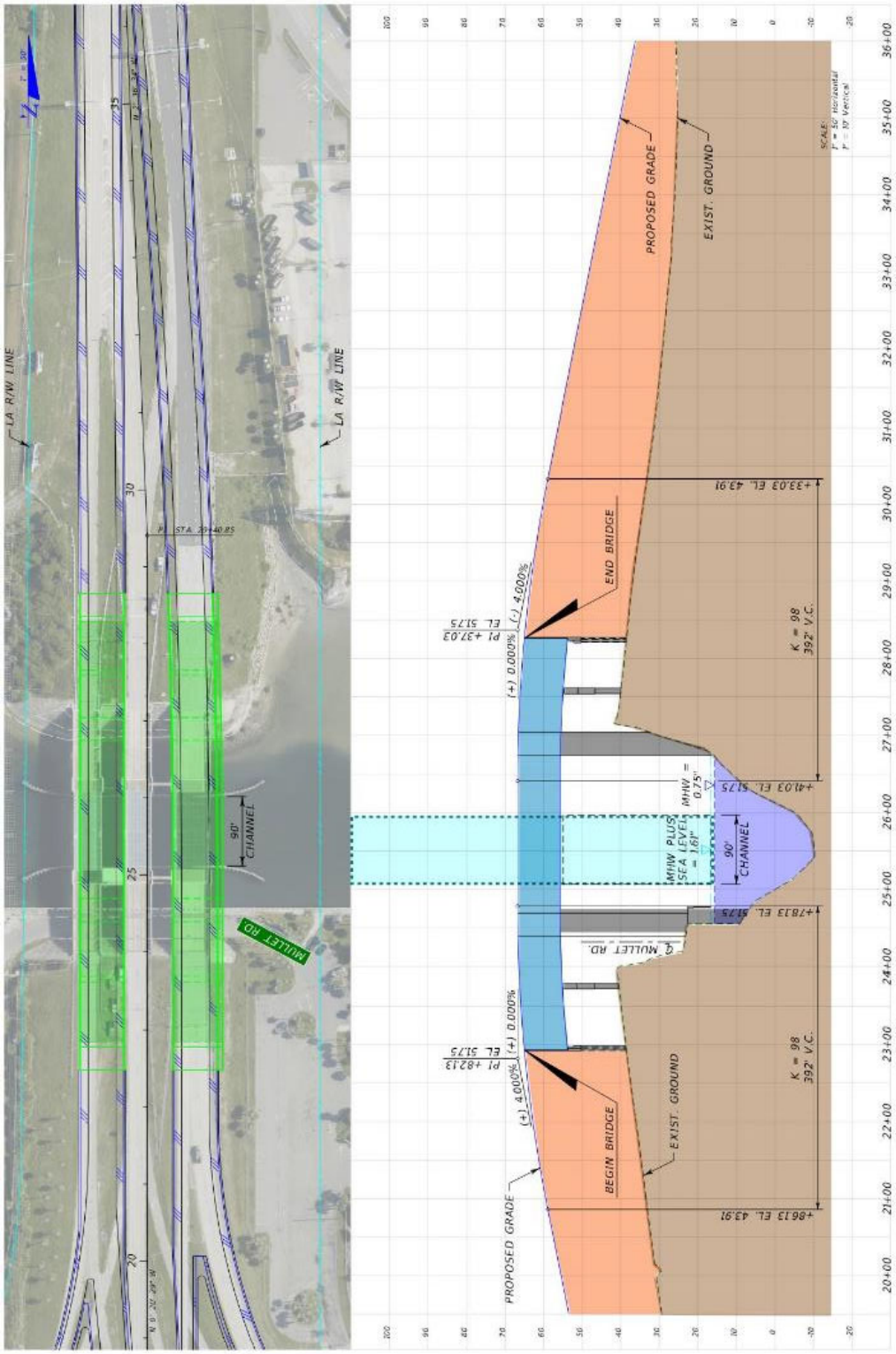


Figure 4-13: Mid-Level Bascule/Drawbridge Alternative Profile

4.6 Evaluation Matrix

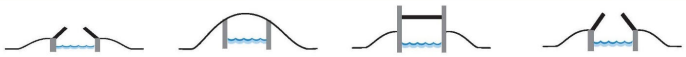
4.6.1 Methodology

Alternatives were evaluated based on the ability of each to meet the project purpose and need. The No-Build alternative served as the base condition against which all other build alternatives were compared. The comparative analysis was based on the ability of all alternatives to meet the project propose & need and consider a 75-year life span for a new bridge. All alternatives analyzed would tie into the existing 60% plans for the S.R. 528/S.R. 401 interchange.

4.6.2 Preliminary Evaluation Matrix

The preliminary evaluation matrix shown below (see Table 4-2) provides a summary of the rankings for the traffic, physical, natural, social, and cost criteria. These rankings are from green, being the most desirable outcome to red, being the least desirable.

Most Desirable *Least Desirable*
Legend



	Evaluation Criteria	No Build*	Fixed Bridge	Lift Bridge	Drawbridge
Traffic	Delays (final condition)				
	Safety				
Physical	Marine Navigation				
	Infrastructure (Billboards, Access)	N/A			
	Utilities	N/A			
Natural	Habitat (Seagrasses, Coral)	N/A			
	Species (Manatees, Wood Stork)	N/A			
	Wetlands	N/A			
Social	Historic/Cultural Resources	N/A			
	Parks/Trails Impacts	N/A			
	Right of Way	N/A			
Costs	Operations & Maintenance (75 years)	$80 M	$20 M	$45 M	$45 M
	Approximate Construction Cost	-	$115 M	$175 M	$190 M

The no build alternative does not meet the project's purpose or need.

Table 4-2: Preliminary Evaluation Matrix Summary

In terms of roadway traffic delays and safety, the High-Level Fixed Bridge Alternative has the best ranking because it provides free flow traffic.

From a marine navigational standpoint, the Bascule/Drawbridge Alternative ranks highest since it offers no limitation on vessel height.

The Bascule/Drawbridge Alternative ranks lowest for utility impacts because the size of the abutments may result in impacts to nearby overhead power lines and buried utilities.

In terms of effects on the natural and social environment, all three build alternatives are expected to result in relatively equal impacts.

From a cost perspective, the No Build Alternative's operations and maintenance over the 75-year design life is expected to exceed $80 million because the bridge is more than 40 years old and will require resurfacing and repairs.

The High-Level Fixed Bridge has the lowest operations and maintenance costs overall because it does not have mechanical or electrical components like the lift bridge and drawbridge.

4.7 Value Engineering Study

The VE team generated and evaluated 29 ideas during the Creative Idea, Evaluation, and Development phases of the VE Job Plan. The ideas were rated based on the evaluation criteria for this project. The objective of this evaluation was to identify ideas with the most promise to achieve savings or adding value while preserving functions or improving the facility's life span.

One of the goals of the VE Team was to identify opportunities through which cost savings might be realized while indicating ways in which the resulting savings might be invested back into the project to realize added value.

The VE Final Resolution resulted in four accepted recommendations, three not accepted and one pending further study, as described below:

Accepted Recommendations

VE Recommendation 1: Increase MSE wall height to reduce the bridge length. After reviewing this recommendation, by our geotechnical and structural team, the 40-foot walls appears feasible and should be investigated further in the design phase

VE Recommendation 12: Enhanced Aesthetics (Shape the lift towers like rockets). Since there is a desire for aesthetic treatments in line with the context of the area, the design team will be exploring aesthetic enhancement options for the recommended High Level Fixed Bridge

VE Recommendation 23: Construct a pond under the bridge. A pond under a portion of the bridge on the north side of the canal is anticipated, therefore, the pond size will be finalized during the design phase.

VE Recommendation 29: Barge demolition material out to a location for an artificial reef development. Because of the potential construction cost savings, the removal and disposal of demo material for the development of an artificial reef will be considered as part of construction plan development.

Pending Further Study

VE Recommendation 4: Utilize the existing service road currently serving the existing canal locks and FP&L distribution system

Recommendations Not Accepted

VE Recommendation 10: Narrow the median width to 30 feet. Because of constructability concerns and the needed offset between proposed NB bridge and the existing SB bascule bridge. Because of these reasons, VE Recommendation 10 was not accepted.

VE Recommendation 15: Revisit the Parsons elevated circle interchange. Although VE Recommendation 15 presented a cost savings opportunity, the design of the elevated circle would cause adverse impacts to S.R. 401 PD&E budget and schedule and would require a redesign of the S.R. 528 interchange (60% plans). Moreover, this concept was not further developed nor presented to the public during the public outreach. Because of these reasons, VE Recommendation 15 was not accepted.

VE Recommendation 19: Raise S.R. 528 profile 8 to 10 feet. The implementation of VE Recommendation 19 would require the redesign of the S.R. 528 interchange, additional ROW and adversely impact the budget and schedule. Therefore, VE Recommendation 19 was not accepted.

Details about the VE workshop, design alternatives, and final recommendations are included in the Final VE Resolution Memo signed by D5 on June 16, 2022, and under separate cover.

4.8 Selection of the Preferred Alternative

After reviewing the Preliminary Evaluation Matrix, the following results are summarized below:

No-Build Alternative – This alternative did not meet the project's purpose and needs, and additionally due the current age of the bridge (40 years), the O&M cost is estimated to exceed $80 million over the 75-year design life.

High-Level Fixed Bridge – This alternative provides a free flow traffic condition; reduces the estimated number of annual bridge openings (2025) from 1,296 (current) to 0 per year (future years); provides minimal environmental impacts; and has the lowest construction and O&M (75 years) costs.

Mid-Level Lift Bridge – This alternative would reduce the annual bridge openings from 1,296 (current) to 312 per year (2025), and the annual traffic delays will be reduced from about 138 hours (current year) to roughly 33 hours (future years). This alternative has no limitation on vessel height; provides minimal environmental impacts; high utility impact cost due to the size of the required abutments, and construction and O&M (75 years) costs were higher than the High-Level Fixed Bridge alternative.

Mid-Level Bascule Bridge – This alternative would reduce the annual bridge openings from 1,296 (current) to 312 per year (future years), and the annual traffic delays will be reduced from about 138 hours (current year) to roughly 33 hours (future years). There would be no limitation on vessel height; minimal environmental impacts; high utility costs due to the size of the required abutments, and construction and O&M (75 years) costs were higher than the High-Level Fixed Bridge alternative.

After analyzing the evaluation matrix and consultation with our stakeholders, the High-Level Fixed Bridge was selected as the recommended alternative based on the S.R. 401 free flow traffic condition, minimal environmental impacts, and the lowest construction and O&M costs.

5. PROJECT COORDINATION AND PUBLIC INVOLVEMENT

5.1 Agency Coordination

This PD&E Study is being conducted by FDOT in coordination with local agencies and organizations that have a stake in this project, including the Canaveral Port Authority.

At the beginning of this study, a technical advisory committee (TAC) was organized, consisting primarily of members of the Canaveral Port Authority staff. There have been numerous meetings and presentations to engage agency and private organizational stakeholders and garner input (see Table 5-1).

Table 5-5-1: Coordination Meetings and Key Talking Points

Organization	Meeting Date(s)	Purpose/Talking Points
Canaveral Port Authority	09-13-2021	Introduce the S.R. 401 project and identify TAC members and preliminary meeting schedule.
Space Coast TPO and Brevard County	09-16-2021	Introduce the S.R. 401 project and discuss County-wide Resiliency Plan. ATMS and ITS approaches.
Canaveral Port Authority	10-06-2021	Discuss the S.R. 401 project (FPID 444787-1) and S.R. 528 project (FPID 407402-4) with Authority staff.
U.S. Army Corps of Engineers (USACE)	10-07-2021	Identify transportation needs (automotive and marine), determine vertical clearance and permitting requirements and/or restrictions.
National Aeronautics and Space Administration (NASA)	10-18-2021	Identify transportation needs (auto/marine) Determine special loading requirements (none)
SpaceX	10-21-2021	Identify transportation needs (auto/marine)
U.S. Space Force	10-26-2021	Identify transportation needs (auto/marine)
Space Florida	10-28-2021	Project overview. Identify key stakeholders to contact for discussions regarding transportation needs and existing/future routes for space vehicle transport (auto/marine).
Canaveral Port Authority and TAC	11-02-2021	Second TAC Meeting - Alternatives Analysis Overview
U.S. Coast Guard	11-05-2021	Follow-up on Safe Harbor and fixed bridge vertical clearance discussion.
U.S. Naval Ordinance Test Unit (NOTU)	11-09-2021	Identify transportation needs (auto/marine). Loading and special vehicle needs, bridge vertical clearance – no concerns. Identify security concerns.

Table 5-5-1: Coordination Meetings and Key Talking Points		
Organization	**Meeting Date(s)**	**Purpose/Talking Points**
U.S. Space Force 5th SLS and Space Launch Delta 45	11-09-2021	Discuss transportation needs and existing/future routes for space vehicle transport (auto/marine) and vertical clearance – no concerns.
Blue Origin	11-10-2021	Identify transportation needs and existing/future routes for space vehicle transport (auto/marine). Discuss bridge vertical and grade – no concerns.
Astrotech	11-16-2021	Identify transportation needs and existing/future routes for space vehicle transport (auto/marine). Discuss bridge vertical clearance and grade – no concerns.
Port Canaveral Cargo Tenants	11-17-2021	Identify cargo volumes and vehicle sizes. Determine loading and vertical clearance needs – no concerns.
Canaveral Port Authority and Brevard County	11-23-2021	Discuss safety and security concerns. Identified impacts to the Port's emergency access gate on NE quadrant of bridge crossing. No feasibility issues.
Florida Power & Light (FP&L)	11-30-2021	Identify potential conflicts with transmission and distribution facilities as a follow-up to the initial utility owner contact.
U.S. Coast Guard	1-31-2022	Further discussion of alternatives
Port Canaveral Cruise Ground Transportation Providers	2-01-2022	Identify ground transportation volumes / concerns. No feasibility issues.
Canaveral Port Authority Staff - Governing Board, Project TAC	2-10-2022	TAC meeting #3. Preview public meeting presentation content.
Space Coast TPO TAC/CAC	3-07-2022	Alternatives analysis overview. PD&E study public involvement and project update.
Space Coast TPO Governing Board	3-10-2022	Alternatives analysis overview. PD&E study public involvement and project update.
Canaveral Port Authority Staff and Project TAC	6-13-2022	TAC meeting #4. Preview alternatives to be shown at the public hearing. Public comment regarding aesthetics.
U.S. Coast Guard	6-22-2022	Project update. No feasibility issues.
U.S. Coast Guard	8-23-2022	Project update. No feasibility issues.
Canaveral Port Authority	9-14-2022	Stakeholder comments – shrimp boat trawlers, aesthetics
Canaveral Port Authority	12-20-2022	Stakeholder comments and Public Hearing overview.
Canaveral Port Authority and Project TAC	1-12-2023	TAC meeting #5. Preview alternatives to be shown at the public hearing. Public comment regarding aesthetics.
NASA and U.S. Space Force	4-7-2023	Future infrastructure needs.
NASA and U.S. Space Force	8-30-2023	Future infrastructure needs.
Space Perspective	9-20-2023	Future infrastructure needs.
NASA and U.S. Space Force	10-31-2023	Future infrastructure needs.

Our team met with the stakeholders on a regular basis to present project information, project updates, and to solicit input on the various alternatives being studied. After numerous meeting, the stakeholders endorsed the High-Level Fixed Bridge as the best alternative to meet their future growth needs.

5.2 Public Involvement Summary

5.2.1 Public Involvement Plan (PIP)

The S.R. 401 PD&E Study Public Involvement Plan (PIP) was prepared in June of 2021. The purpose of the PIP is to assist in providing information to and obtaining input from concerned citizens, agencies, private groups (residential/business), and governmental entities. The overall goal of the plan was to help ensure that the study reflects the values and needs of the communities it is designed to benefit.

5.2.2 Project Kickoff and Stakeholder Coordination Meetings

A Project Kickoff Notice was sent to project stakeholders on September 3, 2021. This notice included a Project Information Handout and FDOT Project Manager's contact information.

5.2.3 Alternatives Public Meeting

Details of the S.R. 401 PD&E Study Alternatives Public Meeting are provided in the Public Meeting Summary Report. The following is a summary:

The Department held a hybrid Public Information Meeting for this PD&E Study on February 23, 2022. Notices of the public meeting were sent to all property owners, business owners, interested persons and organizations to provide the opportunity to offer comments and express their views regarding this project and the proposed improvements.

Participants joined the virtual public meeting on GoTo Webinar, and the in-person meeting was held as an open house at the Port Canaveral Maritime Center at 445 Challenger Road, Cape Canaveral. A recording of the public meeting presentation and copies of the meeting exhibits are available on the project website at www.cflroads.com/project/444787-1.

Attendees (not including FDOT/study team members): While 48 stakeholders registered for the virtual public meeting, 16 attended online. A total of 18 stakeholders attended the in-person open house.

Stakeholders in attendance included: Space Coast TPO, Space Florida Brevard County, Canaveral Port Authority Staff and Commission, City of Cape Canaveral, U.S. Coast Guard, Department of State, FAA, and NASA, as well as private entities such as 888 Transportation (cargo), Blue Origin, SpaceX, Kennedy Marina, Charter Communications, and the Radisson Resort at the Port.

Comments/Questions: The public comment period for this public meeting was open until March 9, 2022. Stakeholders expressed the desire for the project to be fast-tracked. We

received a comment in support of the Fixed Bridge Alternative, and one stakeholder expressed concern that the 65-foot height of the Fixed Bridge Alternative would limit taller (70-foot) marine vessel travel. The Canaveral Port Authority subsequently provided a letter of support for the High-level Fixed Bridge Alternative.

5.2.4 Public Hearing

The FDOT District Five held a hybrid Public Hearing on Tuesday January 31, 2023 (virtual) and Wednesday February 1, 2023, for the S.R. 401 Bridge Replacement PD&E Study. The Department offered multiple ways for the community to participate in the meeting. All participants, regardless of platform they chose, received the same information on the proposed project.

Virtual Option: Interested persons were invited to join from a computer, tablet, or mobile device on Tuesday, January 31, 2023, at 5:30 p.m. For this option, advance registration was required by visiting the following online link https://bit.ly/sr401hearing. Once registered, participants received a confirmation email containing information about joining the hearing online. The virtual hearing began at 5:30 p.m. as an open house to allow participants to view the hearing materials prior to the presentation. The formal hearing presentation began promptly at 6:00 p.m., followed by a formal public comment period.

Phone Option (Listen Only): Participants could also listen to the hearing on Tuesday, January 31, 2023, beginning at 5:30 p.m. by dialing 562-247-8422 and entering a passcode when prompted. Phone option participants were advised on how to submit their public comments after the hearing by contacting the FDOT project manager.

In-Person Option: Participants were also invited to attend in person by going to Canaveral Port Authority, 445 Challenger Road, Cape Canaveral, FL 32920 on Wednesday, February 1, 2023, at 5:30 p.m. The in-person hearing location opened the doors at 5:30 p.m. to allow participants to view the public hearing exhibits and speak one-on-one with project representatives. The formal hearing presentation began promptly at 6:00 p.m., followed by a formal public comment period.

Forty-eight people registered for the GoTo Webinar, and 24 people attended online via computer or mobile device; however, individuals who attended by calling from a land-line are not accounted for in this total. Not including FDOT and PD&E study team staff, 15 people attended the in-person public hearing.

There were no elected public officials noted in attendance at neither the virtual nor the in person public hearing. Representatives from several agencies, including Canaveral Port Authority, U.S. Coast Guard, State of Florida Fish and Wildlife Conservation Commission (FWC) and Department of State (DOS), Space Florida, and the Space Coast TPO registered for and/or attended the public hearing. Additional information and the official Public Hearing transcript are available in the Public Hearing Summary Memorandum, dated March 2023.

6. DESIGN FEATURES OF THE PREFERRED ALTERNATIVE

6.1 Engineering Details of the Preferred Alternative

In summary, the preferred build alternative is the High-level Fixed Bridge. The High-level Fixed Bridge Alternative will replace the existing three bascule bridges with two separate 3-lane high-level, fixed span concrete bridges located on the existing bridge alignment. This improvement will provide a maximum 65-foot vertical clearance above mean high water and a 90-foot horizontal clearance at the main navigational channel. The total bridge length would be 3,210 feet. The maximum grade of 6% and design speed of 45 mph would require a design variation. The High-level Fixed bridge alternative will be designed using 12-foot travel lanes instead of the 11-foot travel lanes recommended in Table 10.2.1 in the FDM. This is due to the anticipated truck traffic being > 10%, the proximity to Cape Canaveral and there future space endeavors, and the available R/W. This allows for the opportunity to design the approach roadways and replacement bridge using the more desirable standards..

For the preferred alternative, some embankment would be required for the S.R. 528 ramps because the proposed bridge would be higher than the existing bridge, but the S.R. 401 roadway and ramps at S.R. 528 would be on the same alignment as the existing conditions.

A section of Mullet Road that runs under S.R. 401 bridges may be temporarily closed during construction, in which case, alternate access to the Canaveral Lock would be provided. Access to the lock has been preliminarily identified and is perpendicular to S.R. 528 at the lock location. See **Appendix B** for the Typical Section Package.

6.1.1 Typical Section

The Typical Section (see figure 6-1), includes the following: two fixed bridges; three 12-foot travel lanes in each direction; 10-foot inside and outside shoulders in each direction; MSE walls and bulkhead reconstruction (southside); no provisions for sidewalks or bike lanes.

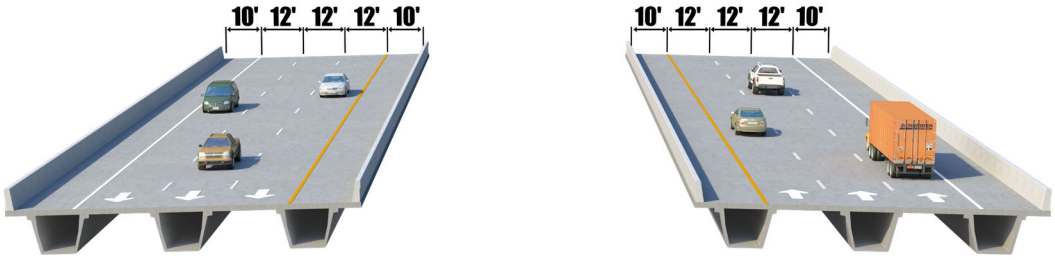


Figure 6-1: High-Level Fixed Bridge Typical Section

6.1.2 Roadway Connections to the S.R. 528 Interchange

South of the new S.R. 401 High-level Fixed Bridge Alternative is the S.R. 401/S.R. 528 (Port Canaveral Interchange). The project is currently 60% completed and is scheduled to be improved as part of S.R. 528 Corridor Improvement project (FPID 407402-4-52-01). This project involves widening S.R. 528 from four to six lanes from east of S.R. 3 to S.R. 401 by adding a lane in each direction in the median. The planned reconstruction at the Interchange includes outside widening to the north of S.R. 528, ramp resurfacing, profile changes along S.R. 528 at S.R. 401 and bridge replacement of S.R. 528 bridge over S.R. 401.

Roadway Improvements to the S.R. 401 High-level Fixed Bridge Alternative are designed to match the future S.R. 528 improvements for vertical, horizontal and drainage elements. Due to the new profile on S.R. 401, interchange ramps on the north side of S.R. 528 are required to be fully reconstructed to meet the new 65 ft VC of the Barge Canal Bridge. Improvement to S.R. 401 will need to be constructed simultaneously or after improvements to S.R. 528 are In place to meet the goal of raising S.R. 401 while maintaining the existing trumpet interchange configuration.

The detailed roadway improvements and typical sections that support the preferred bridge alternative are provided in **Appendix A.**

6.1.3 Horizontal and Vertical Geometry

The preferred alternative horizontal and vertical alignments are shown in the detailed concept plans provided in **Appendix A**. The preferred horizontal alternative will utilize the existing bridge alignment and can be constructed within the existing right-of-way. No additional right-of-way is anticipated. The proposed vertical profile includes two sag curves, and a crest curve with a maximum 6% grade and a design speed 45 mph.

6.1.4 Intersection Concepts and Signal Analysis

The preferred alternative does not include any intersections or traffic signals.

6.1.5 Bridge and Structures

The preferred alternative will replace the existing bascule structures (Bridge Nos. 700030, 700031, and 700117) with twin northbound and southbound high-level fixed bridges. The proposed structures will have a 59-foot out-to-out width and incorporate 42-inch Single Slope Traffic Railings (FDOT Index 521-428) on each side of the northbound and southbound bridges. The bridges will have a 62-foot maximum separation measured from inside copings to facilitate construction of the main channel span unit over the Canaveral Barge Canal. The proposed superstructures will be comprised of three units utilizing 165-foot approach spans and a 230-foot channel span using Precast Concrete Institute's (PCI) variable depth spliced U-girders due to the constrained existing site conditions of the existing bascule bridge foundations that are anticipated to remain. The proposed substructure will consist of reinforced hammer head style piers that are supported on waterline footings and founded

on prestressed concrete piles. It is expected that reconstruction of the existing bulkhead wall will be required in areas where the proposed foundations will be installed. Mechanically Stabilized Earth (MSE) walls will be constructed on both the north and south ends of the bridges. Wall heights are limited to 30-feet to minimize settlement and not require a two-phased wall system. A Bridge Development Report (BDR) containing thorough bridge and wall analyses with multiple alternatives will be completed in the project design phase. See the *High-Level Fixed Bridge Alternative Calculation Technical Memorandum*, which is a stand-alone document located in the project file.

6.1.6 Funding/Planning Consistency

Final design (Preliminary Engineering) is funded with $2.0 million in FY 2022 in the FDOT's Five-Year Work Program; Construction is currently unfunded. The project is identified in the Space Coast TPO's 2045 Long Range Transportation Plan (LRTP) in the Unfunded Needs list of projects.

6.1.7 Access Management

S.R. 401, within the study area, would remain Access Class 03, Non-Restrictive.

6.1.8 Traffic Control Plans

Phase I–- The first phase will be to close the NB Bridge # 700030 to traffic. All existing southbound traffic will be diverted to Bridge # 7000117 and all existing northbound traffic will use Bridge # 700031.

Phase II–- Bridge #700030 will then be demolished (see figures 6-2 and 6-3), and cast-in place foundations constructed. Once the foundations have been completed, the superstructure will then be constructed. Once completed, the new bridge will be opened, and all existing southbound and northbound traffic will be rerouted to the new bridge.

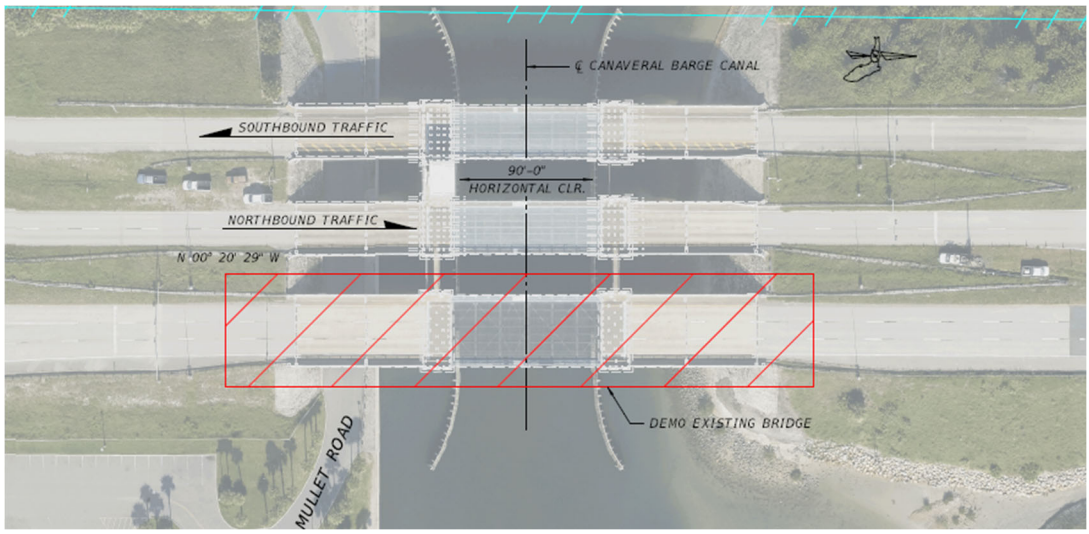


Figure 6-2: Traffic Control Plan Phase II-Demo Existing NB Bridge

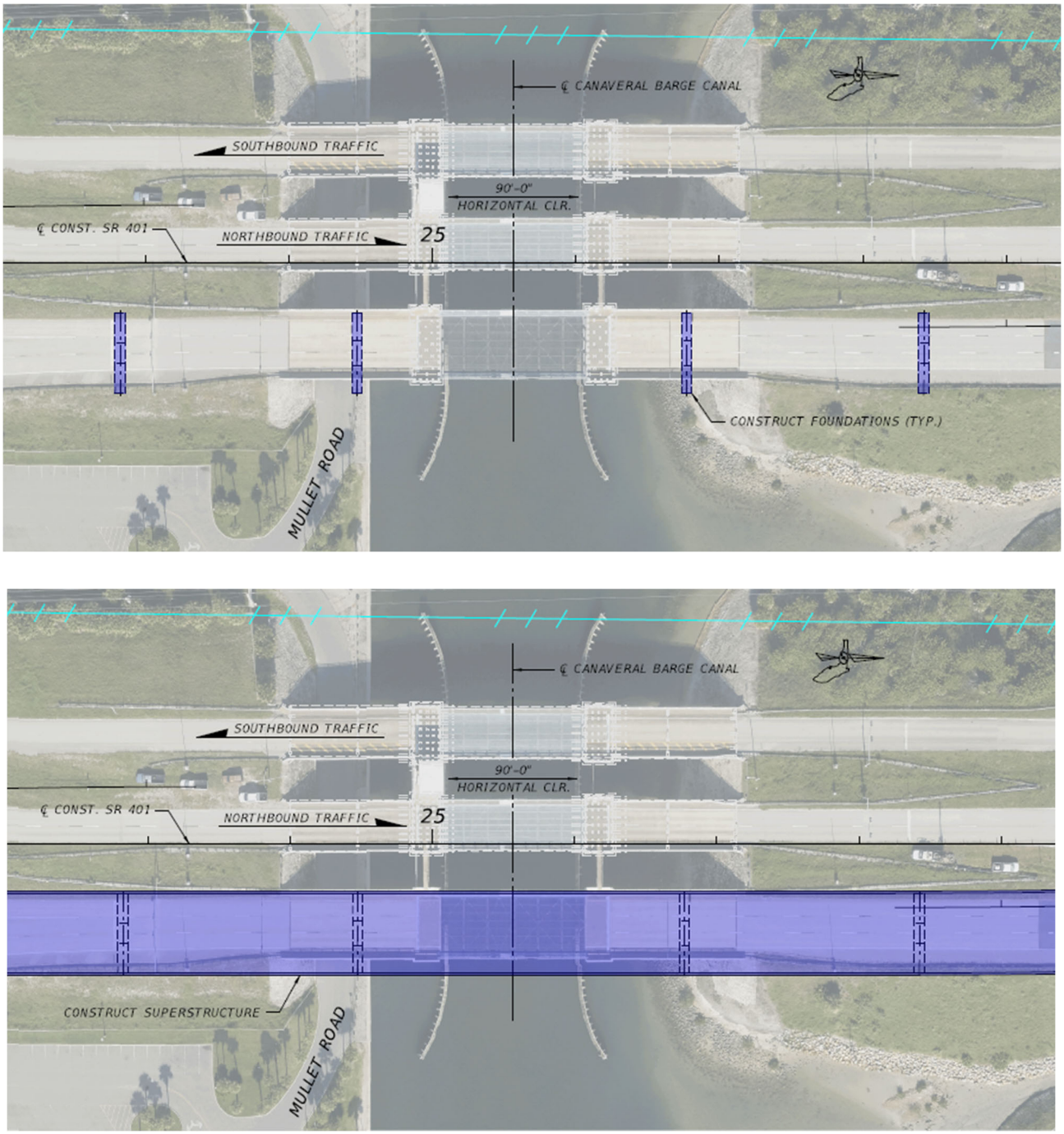


Figure 6-3: Traffic Control Plan Phase II-Construct NB Bridge

Phase III–- Bridge #7000117 and Bridge #700031 will be demolished (see figure 6-4), and cast-in place foundations constructed. Once the foundations have been completed, the superstructure will be then constructed for the new SB bridge.

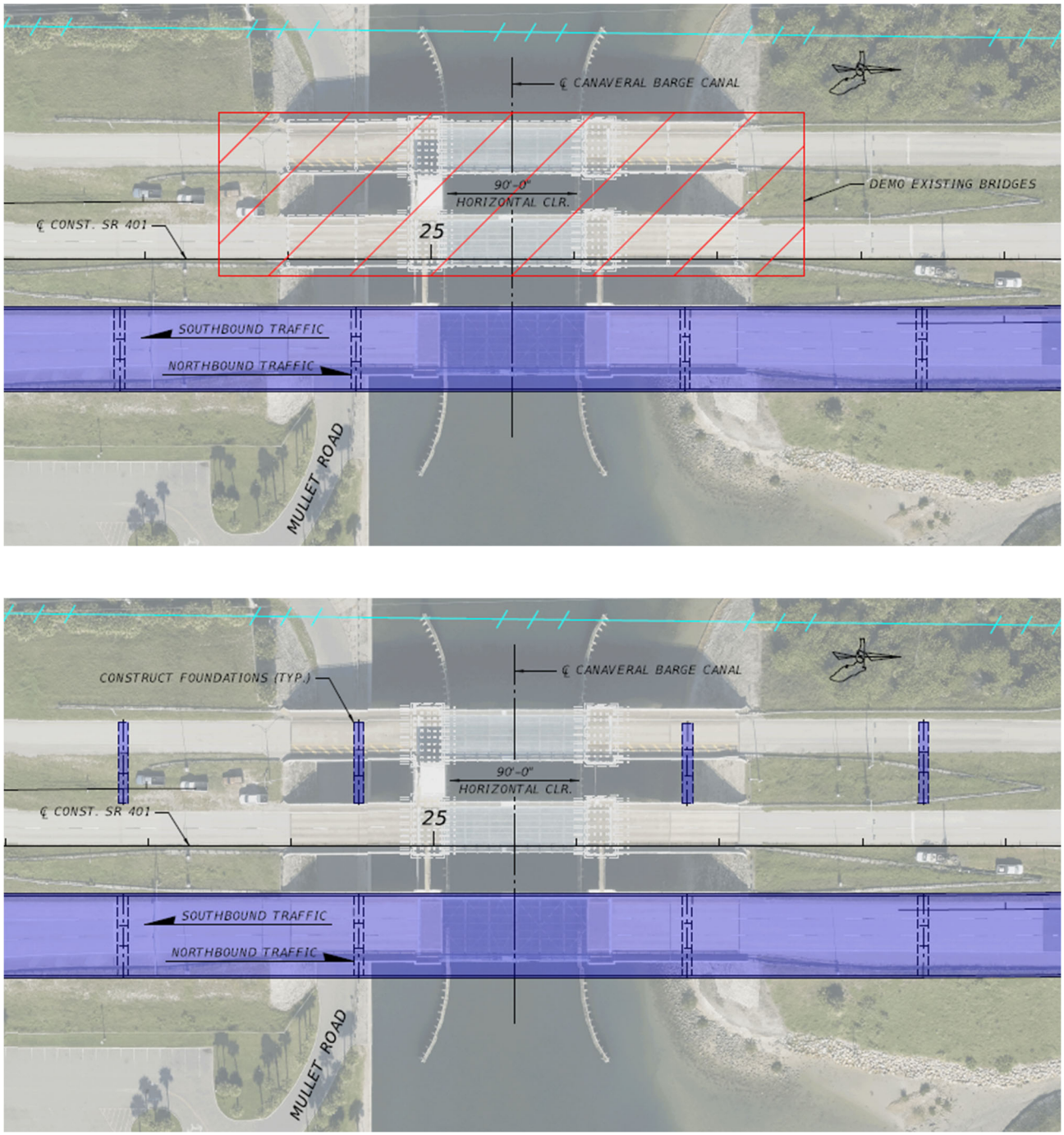


Figure 6-4: Traffic Control Plans Phase III-Demolish and Construct SB Bridge

Phase IV - The new S.R. 401 bridge and approaches will be opened to traffic.

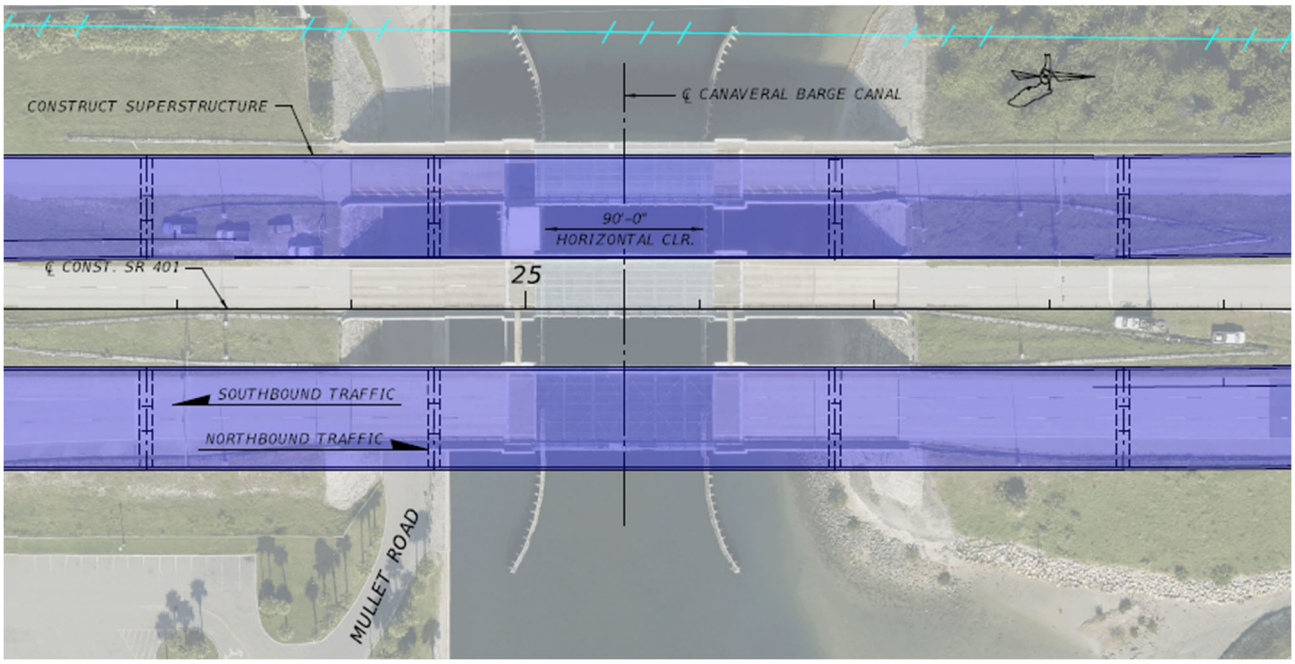


Figure 6-5: Phase IV – Open to Traffic

Mullet Road –- Mullet Road runs under the proposed bridge replacement on the south side of the canal. Mullet Road sole purpose at this location is to serve employees and goods needing access to the canal control facilities located east of the Canaveral Barge Canal Bridge and south of the Canal Locks. In order to execute bridge replacement activities over Mullet Road, the road will be temporarily closed to traffic under the proposed bridge. Upon evaluation and discussion with the U.S. Army Corps of Engineers, it is proposed that a temporary access from S.R. 528 be created during construction. The temporary access will extend the existing access road and make a perpendicular connection to S.R. 528 directly south of the canal control facilities allowing for trucks and employees to be able to access the locks. This access will be exclusive to canal personnel and operational needs, hence providing continues service to current users of the road in a temporary basis.

S.R. 528 - All existing traffic movements will be maintained on the S.R. 528/S.R. 401 interchange. Temporary ramps will need to be installed based on the bridge phasing scheme to keep connections. There will be a lane reduction from 3 lanes in each direction to 2 lanes in each direction over the barge canal. Advance notice of upcoming changes and new configurations will be part of the TCP.

6.1.9 Lighting

During the design phase of the project, the need for lighting will be evaluated in accordance with applicable manuals, guideline, standards, and current design memorandums. A Lighting Justification Report is not anticipated for this project. The Roadway Lighting Tool will be used for rough photometrics to determine a preliminary cost estimate for lighting from the new bridges, north to the end of the project limits. Estimated lighting costs will be included in the construction cost estimate for the Recommended Project alternative.

6.1.10 Landscape Opportunity Plan

As an important linkage to Port Canaveral, the new S.R. 401 bridge connection and landscape will provide compression and opening of views that builds excitement as motorists cross the bridge (see figure 6-6). The native sea salt tolerant plant palette in impactful groves and massing will highlight and enhance the bridge architecture and provide a celebration gateway experience for visitors and residents to the port and cruise terminals. Erosion control and habitat for coastal fauna will also be provided with the native plantings and placement. Figure 6-6 represents only one option, additional landscaping and aesthetic options will be reviewed during the design phase.

Figure 6-6: Landscape Opportunity Plan

6.1.11 Future Operational Analysis

An operational analysis was conducted for the preferred Fixed Span Bridge Alternative for opening and design years 2030 and 2050 for the Build and No-Build (existing geometry). (See Tables 6-1 through 6-4).

The results from the operational analysis for the existing and future conditions with the High-Level Fixed Span Bridge Alternative (Build condition) showed that the study area roadways and ramps operate at an acceptable level of service “D” or better during AM and MD in the future. The safety analysis also indicated that the High-Level Fixed Span Bridge Alternative yielded the greatest number of reduced crashes per year. The No-Build condition considered the existing lane geometry. The proposed geometry is the same for the HCS analysis along S.R. 401 and along the ramps except for the future S.R. 528 mainline which is proposed to be six lanes instead of four lanes within the project limits. These improvements along S.R. 528 will be implemented by year 2030, under FM #407402-4-52-01.

Table 6-6-1: Year 2030 No Build & Build AM/MD HCS Freeway & Ramp Summary

Location ID	Freeway			Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
1. S.R. 528 EB Freeway Segment from N Banana to S.R. 401	2400/2500	17.0/16.8	B/B			
2. S.R. 528 EB off Loop Ramp to S.R. 401 NB	2400/2500			650/1100	21.0/21.9	C/C
3. S.R. 528 EB on Ramp from S.R. 401 SB	1750/1400			400/450	17.3/13.1	B/B
4. S.R. 528 EB Freeway Segment from S.R. 401 to George King Blvd	2150/1850	16.8/12.2	B/B			
5. S.R. 528 WB Freeway Segment from George King Blvd to S.R. 401	1400/1900	9.7/12.5	A/B			
6. S.R. 528 WB off Ramp to S.R. 401 NB	1400/1900			450/800	2.6/4.5	A/A
9. S.R. 528 WB on Ramp from S.R. 401 SB	950/1100			450/550	13.9/14.4	B/B
1. S.R. 528 WB Freeway Segment from S.R. 401 to N Banana River Dr	1400/1650	10.2/11.4	A/B			

Table 6-6-1: Year 2030 No Build & Build AM/MD HCS Freeway & Ramp Summary						
Location ID	Freeway			Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
6.1 & 6.2. NB off Ramp from S.R. 401 to Charles M. Rowland Dr. NB	1100/1900			290/820	2.7/11.8	A/B
7. SB on Ramp from Charles M. Rowland Dr. to S.R. 401	300/450			550/550	11.2/10.1	B/B

Table 6-6-2: Year 2030 No Build & Build AM/MD HCS Multilane Summary						
Location ID	NB			SB		
	Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Volume (veh/hr)	Density (pc/mi/ln)	LOS
8. S.R. 401 from S.R. 528 to Charles M. Rowland Dr	1100/1900	10.5/18.4	A/C	850/1000	8.0/9.7	A/A
8. S.R. 401 from North of Charles M. Rowland Dr	810/1080	11.6/16.2	B/B	300/450	4.8/7.2	A/A

Table 6-6-3: Year 2050 No Build & Build AM/MD HCS Freeway & Ramp Summary						
Location	Freeway			Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
1. S.R. 528 EB Freeway Segment from N Banana to S.R. 401	2800/3000	20.4/20.5	C/C			
2. S.R. 528 EB off Loop Ramp to S.R. 401 NB	2800/3000			750/1500	24.4/26.5	C/C
3. S.R. 528 EB on Ramp from S.R. 401 SB	2050/1500			600/550	22.9/18.8	C/B
4. S.R. 528 EB Freeway Segment from S.R. 401 to George King Blvd	2650/2050	20.6/13.5	C/B			
4. S.R. 528 WB Freeway Segment from George King Blvd to S.R. 401	1500/2300	10.6/15.3	A/B			

Table 6-6-3: Year 2050 No Build & Build AM/MD HCS Freeway & Ramp Summary						
Location	Freeway			Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
5. S.R. 528 WB off Ramp to S.R. 401 NB	1500/2300			450/1100	0.8/8.3	A/A
9. S.R. 528 WB on Ramp from S.R. 401 SB	1050/1200			600/750	16.9/18.0	B/B
1. S.R. 528 WB Freeway Segment from S.R. 401 to N Banana	1650/1950	12.3/14.0	B/B			
6.1 & 6.2. NB off Ramp from S.R. 401 to Charles M. Rowland Dr. NB	1200/2600			350/1090	3.8/20.0	A/B
7. SB on Ramp from Charles M. Rowland Dr. to S.R. 401	400/600			800/700	16.0/13.5	B/B

Table 6-6-4: Year 2030 No Build & Build AM/MD HCS Multilane Summary						
Location ID	NB			SB		
	Volume (veh/hr)	Density (pc/mi/ln)	LOS (AM/MD)	Volume (veh/hr)	Density (pc/mi/ln)	LOS
8. S.R. 401 from S.R. 528 to Charles M. Rowland Dr	1200/2600	12.2/25.7	B/C	1200/1300	11.3/12.9	B/B
8. S.R. 401 from North of Charles M. Rowland Dr	850/1510	13.2/23.4	B/C	400/600	6.5/10.1	A/A

6.1.12 Preliminary Drainage Analysis

Location Hydraulics Summary

The proposed drainage improvements include a linear dry detention treatment system for the North basin. For the South basin, modifications to infield pond control structures are proposed. These improvements will provide water quality treatment to meet St. Johns River Water Management District Requirements.

Due to potential floodplain impacts from the proposed stormwater management facilities the project improvements are considered a ***Minimal Encroachment.*** The potential floodplain encroachments have a very low probability for potentially causing adverse impacts to

adjacent land uses including residential, business and transportation uses based on the Barge Canal's unrestricted hydraulic connection with the Atlantic Ocean.

The potential impacts are not likely to require floodplain compensation; however, if required, potential measures to minimize impacts with the proposed stormwater management facility include designing the system as much as possible at the high end above the 100-year flood elevation.

The proposed improvements require coordination and approval from several permitting agencies including the St. Johns River Water Management District, United States Coast Guard and U.S. Army Corps of Engineers. The recommendations and conclusions may be updated pending the ongoing coordination and conditions of the permits obtained from these agencies. For additional information, please review the Location Hydraulic Report, dated June 2022.

Pond Siting Summary

For the north basin, runoff would be contained in a linear dry detention or dry retention swale. The swale system would be within the proposed project limits and existing right-of-way. Ditch blocks placed in the swale will provide the treatment volume. The swale system will maintain the existing outfall at the Barge Canal. There are no anticipated wetland or environmental impacts.

For the south basin, suggested modifications to the infield wet detention ponds to be installed with the S.R. 528 project are recommended. In that project, dry ponds at the S.R. 401 interchange are being converted into wet detention ponds. Existing pipe connection under S.R. 528 will connect the infield ponds to the existing mitigation pond system in the southeast quadrant. The stormwater pond control structure and pond side slopes would be modified as necessary to satisfy treatment and attenuation rules. In the case of needing to modify the control structure, the weir would be raised to increase treatment volumes to compensate for the additional impervious added due to the project.

The proposed improvements require coordination and approval from several permitting agencies including the St. Johns River Water Management District, United States Coast Guard and U.S. Army Corps of Engineers.

6.1.13 Bridge Hydraulic Analysis

The Bridge Hydraulic analysis provided water levels and wave climate parameters at the S.R. 401 bridge utilizing FEMA Flood Insurance Study (FIS) for Brevard County, Florida (provided still water elevation and wave heights at the bridge) (see Table 6-5). LiDAR data in the vicinity of the S.R. 401 over Canaveral Barge Canal Bridge provided the upland ground elevation. Sea Level Rise was also considered based on NOAA data (FDOT 2020a).

The results are summarized as follows:

1. The design storm frequency equals 50 years, given the bridges' Average Daily Traffic exceeds 1,500 (FDOT, 2021).
   - 50-year water surface elevation equals +6 ft- North American Vertical Datum (NAVD)
2. The scour design flood frequency equals 100 years and the scour design check flood frequency equals 500 years. (FDOT, 2020a).
   - 100-year water surface elevation equals +7.2 ft-NAVD
   - 500-year water surface elevation equals +9.6 ft-NAVD
3. For concrete superstructures in aggressive environments (high chloride content), the FDOT (2020) states that the minimum vertical clearance equals 12 ft between mean high water (MHW) and the low member of bridges.
   - Mean High Water equals +0.75 ft-NAVD
4. Sea Level rise is based on NOAA station 8721120, a 75-year life, and bridge construction completion date of 2030.
5. Summarizing the results of the SLIP analysis,
   - Based on the SLIP Map from the FDEP website, It appears that our project falls outside of the Coastal Building Zone (CBZ) Boundary that requires a SLIP study. The CBZ boundary runs up and down the east coast, our project is just short of a mile to the west of the westernmost CBZ limit.

Finally, for coastal bridges, the FDOT (2020) requires that the vertical clearance between the superstructure and the 100-year wave crest elevation (including storm surge and wind setup) must equal at least one foot. If not, the FDOT (2021) requires a qualified coastal engineer address the requirements found in AASHTO (2008) — essentially, requiring the bridge withstand forces due to waves.

Table 6-6-5: Year Wave Crest Elevations

Location	Wave Crest Elevation (ft-NAVD88)	Wave Crest Elevation w/ Sea Level Rise (ft-NAVD88)
Top of Slope Protection – North Abutment	+7.96	+9.57
Toe of Slope Protection	+10.71	+10.11
Channel	+10.00	+10.86
Top of Seawall – South Abutment	+7.33	+8.82

6.1.14 Recycling and Salvageable Material

As one of the VE recommendations was for recycling salvageable material, the Concept Design Plans show removal of the existing bascule bridges in preparation for the Construction of the new bridges. They also show a line of bulkhead wall along the south side that will be partially removed and replaced. This activity can be stipulated as a requirement of construction and supported by the Planning and Environmental Management Office (PLEMO), permitting agencies and D5 construction. The stipulation would shift demo removal activity from contractor means and methods to further development of the artificial reef already started by D5 which is near the project site. In addition to the potential construction cost savings, the U.S. Department of the Interior notes that artificial reef programs are a "win for ocean life, outdoor enthusiasts, and states. Artificial reefs provide shelter, food and other necessary elements for biodiversity and a productive ocean. This in turn creates a rich diversity of marine life, attracting divers and anglers. And states like the program because the increased tourism and commercial fishing benefits local economies." The removal and disposal of demo material for the development of an artificial reef should be part of construction activities.

6.1.15 Special Features

MSE Walls and the reconstruction of the southside Bulkhead Wall will be required, see section 6.1.5, Bridge and Structures for additional information. A Bridge Development Report will be completed during the final design phase.

6.1.16 Design Variations and Design Exceptions

The High-Level Fixed Bridge Alternative has a proposed maximum grade of 6% and a design speed of 45-mph. Although common for high-level bridges over the intracoastal waterways, a design variation for the 6% grade and the 45-mph design speed will be required as they are non-standard features based on FDOT standards. The design variation is needed when the profile grades exceeds the 4% max grade called for in the FDM, and when the truck traffic is 10% or more.

6.2 Summary of Environmental Impacts of the Preferred Alternative

6.2.1 Natural Resources

Wetlands and Other Surface Waters

In summary, approximately 1.19 acres of wetlands and 0.09 acres of OSWs are proposed to be impacted by the project. Mitigation options are limited and at this time there are no mangrove credits available from surrounding mitigation banks as of this report date. Mitigation options will continue to be reviewed especially as related to the minor amount of mangrove impact and other wetland impacts. FDOT will coordinate with St. Johns River Water Management District (SJRWMD) to determine available mitigation options.

In accordance with State criteria, water quality will be treated prior to discharge to receiving anticipated that the total acreage of both WL-9 and WL-10 will be impacted. Additionally, the existing bridges over OSW-3 have a current shading area of 0.56 acres and the shading area for the waters including the Indian River Lagoon (IRL). Therefore, indirect impacts to the IRL are not anticipated. A small portion of WL-9 and WL-10 falls outside the project impact area buffer. However, it is anticipated that these remnant wetlands would not succeed. Therefore, it is proposed bridges is approximately 0.55 acres. Therefore, negligible shading impacts are anticipated. It should be noted that no seagrass or corals were found under or adjacent to the bridge. Some oysters were observed attached to the bridge fender system.

Wetland Impacts

For the purpose of this wetland impact assessment, impacts to wetlands and OSWs were calculated based on the project impact footprint. This is a worst-case scenario and will be refined during the design/permitting phase. Direct impacts to wetlands and OSWs are anticipated. It is estimated that a total of a total of 1.19 acres of wetlands will be directly impacted, and 0.09 acres of OSWs will be impacted. Tables 6-6 and 6-7 summarize the impacts to wetlands and OSWs for this project.

Table 6-6-6: Summary of Potential Wetland Impacts

ID	FLUCCS Code	Size (Acres)	Direct Wetland Impacts
WL-1	612	3.33	0.10
WL-2	642	0.13	0
WL-3	612	0.04	0
WL-4	651	0.25	0
WL-5	642	0.01	0
WL-6	612	0.02	0
WL-7	651	0.78	0
WL-8	612	13.91	0
WL-9	631	0.66	0.44
WL-10	631	0.50	0.50
WL-11	641	0.15	0.15
WL-12	612	35.26	0
WL-13	612	1.96	0
WL-14	612	1.04	0
Total acres of impacts:			**1.19**

Table 6-6-7:Summary of Potential OSW Impacts			
ID	**FLUCCS Code**	**Size (Acres)**	**Direct OSW Impacts (Acres)**
OSW-1	542	5.22	0
OSW-2	534	0.56	0
OSW-3	510	N/A*	0.09
OSW-4	534	9.63	0
OSW-5	534	2.50	0
OSW-6	524	8.74	0
Total acres of impacts:			**0.09**
***Note**: *Extends beyond project limits*			

Threatened and Endangered Species

The FDOT ETDM Screening Summary Report, FDOT Environmental Screening Tool, U.S. Fish and USFWS-listed species database for Brevard County, Florida Natural Areas Inventory (FNAI), and USFWS Information for Planning and Consultation (IpaC) were reviewed to develop a project-specific protected species list. This list was then compared to field conditions during the field reviews to correlate the habitat of each listed species with habitat present on the corridor. Per the *USFWS IpaC database*, critical habitat for West Indian manatee (*Trichechus manatus latirostris*) is present. Consultation areas are present for scrub-jay and piping plover.

The potential effect on each federally listed species is summarized in Table 6-8. Note that species listed as federally endangered or threatened are also listed by the State of Florida as endangered or threatened. A total of 18 federally listed species were identified to potentially occur in the project area.

Table 6-6-8: Federally Listed Species Determination of Effect				
Scientific Name	**Common Name**	**Listing Status***	**Determination of Effect****	**Jurisdictional Agency**
Reptiles				
Chelonia mydas	Green sea turtle	FT	MANLAA	NMFS
Caretta	Loggerhead sea turtle	FE	MANLAA	NMFS
Eretmochelys imbricata	Hawksbill sea turtle	FE	MANLAA	NMFS
Dermochelys coriacea	Leatherback sea turtle	FE	MANLAA	NMFS
Lepidochelys kempii	Kemp's ridley sea turtle	FE	MANLAA	NMFS

Table 6-6-8: Federally Listed Species Determination of Effect				
Scientific Name	**Common Name**	**Listing Status***	**Determination of Effect****	**Jurisdictional Agency**
Drymarchon coria couperi	Eastern indigo snake	FT	NE	USFWS
Nerodia clarkia taeniata	Atlantic salt marsh snake	FT	NE	USFWS
Birds				
Charadrius melodus	Piping plover	FT	NE	USFWS
Calidris canutus rufa	Rufa red knot	FT	NE	USFWS
Mycteria americana	Wood stork	FT	MANLAA	USFWS
Laterallus jamaicensis spp. Jamaicensis	Eastern black rail	FT	NE	USFWS
Aphelocoma coerulescens	Florida scrub-jay	FT	NE	USFWS
Mammals				
Trichechus manatus latirostris	West Indian (Florida) Manatee	FT	MANLAA	USFWS
Peromyscus polionotus niveiventris	Southeastern beach mouse	FT	NE	USFWS
Fish				
Manta birostris	Giant manta ray	FE	MANLAA	NMFS
Pristis pectinata	Smalltooth sawfish	FE	MANLAA	NMFS
Plants				
Warea carteri	Carter's mustard	FE	NE	FDACS
Polygala lewtonii	Lewton's polygala	FE	NE	FDACS

***Note**: FT = Federally designated Threatened; FE = Federally designated Endangered*
*** NE = No Effect; MANLAA = May Affect, Not Likely to Adversely Affect*
FDACS = Florida Department of Agriculture and Consumer Services

The potential effect on each state listed species is summarized in Table 6-9 below. A total of eight state only listed species were identified to potentially occur in the project area. Each species and their habitat requirements are discussed in the following sections.

Table 6-6-9: State Listed Species Determination of Effect				
Scientific Name	**Common Name**	**Listing Status***	**Determination of Effect**	**Jurisdictional Agency**
Reptiles				
Gopherus polyphemus	Gopher tortoise	ST	No Effect Anticipated	FWC
Birds				
Rynchops niger	Black skimmer	ST	No Effect Anticipated	FWC
Haeatopus palliates	American oystercatcher	ST	No Effect Anticipated	FWC
Sternula antillarum	Least tern	ST	No Effect Anticipated	FWC
Egretta rufescens	Reddish egret	ST	No Effect Anticipated	FWC
Egretta caerulea	Little blue heron	ST	No Effect Anticipated	FWC
Egretta tricolor	Tricolored heron	ST	No Effect Anticipated	FWC
Platalea ajaja	Roseate spoonbill	ST	No Effect Anticipated	FWC
***Note**: ST = State Threatened FWC = Florida Fish and Wildlife Conservation Commission*				

A discussion of potential impacts to each of the species listed in the above tables is included in the *Natural Resources Evaluation (NRE),* a companion document to this PER. During construction of this project, the FDOT's contractor will adhere to the most recent version of the USFWS's Standard Protection Measures for the Eastern Indigo Snake to minimize the potential for adverse effects.

Critical Habitat

Critical habitat is a specific, federally designated, geographic area that is essential for the conservation of a threatened or endangered species that may require special management and protection. Per the USFWS IPaC database, critical habitat for the Florida manatee is located in the Canaveral Lock, on the western side of the S.R. 401 bridges.

Agency Concurrence

FDOT will coordinate with USFWS and National Marine Fisheries Service (NMFS) to obtain concurrence on the determination of effects to federally listed species. Noise impacts to underwater species will be assessed during final design to assist in NMFS consultation.

Essential Fish Habitat

Due to the proposed bridge replacement, it is anticipated that approximately 0.10 acres of mangrove EFH as well as approximately 0.09 acres of direct impact to sand/shell bottom EFH due to bridge widening and in-water work. Sand/shell bottom is EFH for the penaeid shrimp. Furthermore, no impacts to seagrass EFH are anticipated.

6.2.2 Sociocultural Features

Future Land Use

Future land use for this corridor will continue to be transportation and Port Facilities according to the Port Strategic Vision Plan.

Bicycle and Pedestrian Accommodations

Bicycle lanes and pedestrian sidewalks will not be provided on the preferred alternative as S.R. 401 is a limited access facility and stakeholders expressed safety and security concerns with having bicyclists and pedestrians in the area.

Cultural Resources

A Cultural Resource Assessment Survey (CRAS) was conducted in support of the proposed bridge replacement along S.R. 401 in Brevard County, Florida.

To encompass all potential improvements, the area of potential effects (APE) was defined to include the existing right-of-way where improvements are proposed, including the three bridges spanning the Canaveral Barge Canal, as well as the right-of-way along the S.R. 401 interchange with the S.R. 528 Causeway for a total length of approximately 0.7 miles of S.R. 401 and 0.5 miles of S.R. 528 Causeway. This APE was extended to the back or side property lines of parcels adjacent to the right-of-way or a distance of no more than 330 feet from the right-of-way line. Given the absence of natural soils within the project right-of-way, no archaeological survey was conducted. The historic structure survey was conducted within the entire APE.

There are two historic bridges located within the S.R. 401 Bridge Replacement APE. The FDOT Bridge Nos. 700074 (ca. 1971) and 700140 (ca. 1971) are concrete stringer/multi-beam or girder bridges. These two bridges are located along S.R. 528 where it crosses over S.R. 401 (S.R. A1A). These two bridges fit the description of common bridges within the scope of the 2012 *Program Comment Issued for Streamlining Section 106 Review for Actions Affecting Post-1945 Concrete and Steel Bridges* and are excluded from Section 106 consideration (Federal Register 2012:68793). Finally, these two bridges meet the stipulation outlined in the aforementioned Program Comment; therefore, further evaluation of these bridges is beyond the scope of the current project.

The architectural survey resulted in the identification and evaluation of five previously recorded historic resources within the S.R. 401 Bridge Replacement APE (8BR03009, 8BR03010, 8BR02936, 8BR03394, and 8BR03395). Resources 8BR03009 (Bridge No. 700030), 8BR03010 (FDOT Bridge No. 700031), and 8BR03395 (Bridge No. 700117) were determined ineligible for inclusion in the National Register of Historic Places (NRHP) by the Florida State Historic Preservation Office (SHPO) (SEARCH 2017). The S.R. 528 Causeway (8BR03394) was determined ineligible for inclusion in the NRHP by the Florida SHPO

(SEARCH 2019). Finally, the Canaveral Lock (8BR02936) resource group has previously been determined eligible for listing in the NRHP by the Florida SHPO (USACE 2012, SEARCH 2017), and based upon the results of the current survey, 8BR02936 remains eligible for NRHP listing. No existing or potential historic districts were identified. Based on the results of the CRAS, the proposed S.R. 401 Bridge Replacement project will have no adverse effect to Resource 8BR02936, which is eligible for listing in the NRHP. On March 1, 2022, the Florida State Historic Preservation Officer (SHPO) concurred that based on the results of this study, it is the opinion of the district that the proposed undertaking will have no adverse effect on NRHP-listed or -eligible historic properties. No further work is recommended.

Economic and Community Development

According to the Port Authority, the activity throughout Port Canaveral contributed $1.94 billion in direct industry output to the Central Florida regional economy during 2018. This output generated an estimated 17,237 jobs throughout the Central Florida region paying annual wage income of $729.4 million.

The preferred alternative will better accommodate consumers crossing the bridge to utilize services at the port, such as boarding cruise ships and sailing personal sea vessels, cruise and freight ships entering and leaving the Port, cargo transport crossing the bridge by truck, and transport demand related to the U.S. Space Force, Space X, Blue Horizon stations.

Aesthetics and Landscaping

Coordination between FDOT and the Canaveral Port Authority with regard to aesthetics and potential landscaping treatments is ongoing.

Section 4(f) Resources

Rodney Ketcham Park is located directly east of S.R. 401 and northeast of Mullet Road. While the park is located directly adjacent to the proposed construction, no work is proposed within the park. Access is currently through Mullet Road, just off of S.R. 528/S.R. A1A. Access will continue to be maintained during construction as the access point is east of the project limits and through S.R. A1A, which has no proposed work. Staging or storing of materials is not proposed within park boundaries.

There is one two-sided FDOT-permitted Outdoor Advertising Sign Structure located northeast of the Canaveral Barge Canal (Tag Ci117 - facing south and Tag Ci118 - facing north). This sign structure is owned by Clear Channel Communications. The preferred alternative may impact potential views of this sign structure. Viewshed impacts will be verified and coordinated during design.

6.3 Physical Effects

6.3.1 Noise Impacts

The traffic noise study is being conducted based upon the current regulatory criteria contained in Part 2, Chapter 18 Noise (July 1, 2020) of the PD&E Manual and the Traffic Noise Modeling and Analysis Practitioners Handbook dated January 1, 2016. The noise study is utilizing the Traffic Noise Model (TNM) version 2.5 which is the most current model available for the prediction of highway traffic noise levels. Traffic noise impacts are being evaluated for noise sensitive sites determined prior to the project's Date of Public Knowledge (DPK). Based upon the DPK, Activity Category B and C land uses are being assessed for potential noise impacts. Noise abatement criteria (NAC) for both of these land use categories are 66 dB(A)s.

Twelve noise sensitive receptor locations are being modelled using TNM. These receptors are located in the Rodney S. Ketcham Park/Boat Ramp area and the marina located at the southeast quadrant of the bridge. The marina provides dockage for live-aboard tenants.

Noise levels at the twelve noise sensitive receptor locations are not anticipated to approach or exceed the applicable NAC as a result of the project; therefore, noise abatement measures for the preferred alternative are not expected to be necessary.

6.3.2 Contamination

The proposed improvements will not impact the six low-risk contamination sites identified along the project corridor as detailed in the Contamination Screening Evaluation Report (CSER).

6.3.3 Utilities

Potential utility conflicts associated with the High-level fixed bridge alternative include:

AT&T Florida (telephone)

- A 1-4" PVC BT Duct crossing S.R. 401 approx. 600 feet south of the Canaveral Barge Canal.
- 2-4" PVC Duct running north-south along the east LA R/W to a BT Manhole (P-1) located 10 ft south of Mullet Road
- A 600-pair 2" subaqueous copper BT crossing the Canaveral Barge Canal approximately 100 feet west of S.R. 401 to a BT Manhole (P-2) located approximately 350 feet north of the Canaveral Barge Canal adjacent to northbound S.R. 401

Charter Communication/ Spectrum (CATV)

- Per correspondence from Paul Rymer, Construction Specialist, Spectrum has no facilities within the study limits; however, in February 2022, Charter Communications

contacted the study team to inquire about placing a pipe in the head wall on the bridge during the construction of the bridge for future fiber.

City of Cocoa (Water)

- South of the S.R. 401 Bridges, a City of Cocoa 24" water main runs along the western edge of Mullet Road. At about 500 feet North of the bridges, the water main is 60-80 feet east of the S.R. 401 edge of pavement.
- A 6" asbestos concrete water main (out of service) runs along western edge of the S.R. 528 WB on ramp right of way, crossing S.R. 401 approximately 250 feet south of Mullet Road and running along eastern edge of the S.R. 528 EB off ramp.
- 36" Concrete WM that runs along western edge of the R/W for the S.R. 528 WB on ramp (approx. 10-15 ft west of the 6" AC WM), crossing S.R. 401 approx. 675 feet south of Mullet Road and running along the western edge of Mullet Road.

FP&L Power

- The FP&L Transmission pole line has three high-voltage 69kV OE Transmission lines run north-south just west of the LA right of way within an easement. The Transmission lines cross S.R. 401 approximately 175 feet north of the S.R. 528 overpass. FP&L Distribution has three 12.6kV OE Distribution underlines on the existing FP&L Transmission Pole Line within an easement.
- A Transmission Power Pole located just south of Mullet Road on the west side of the S.R. 401 Bridge could potentially conflict with construction of the southbound bridge.
- The FP&L OE Transmission and Distribution (under lines) that cross S.R. 401 on Transmission poles approximately 175 feet north of the S.R. 528 overpass will likely conflict with the new S.R. 401 profile at this location.
- Approximately 650 feet north of the S.R. 401 Bridges, an FP&L distribution service connection crosses the LA R/W and will conflict with the higher S.R. 401 profile.

A Utility Assessment Report is being completed for this project, and coordination with UAOs is ongoing. The Utility Assessment Report will include a utility conflict matrix and high-level estimates for utility adjustments and relocations. This report will serve as a basis for the design utility coordination effort.

6.3.4 Intelligent Transportation Systems (ITS)

This project will have CCTV coverage along the entire corridor and interchange. The existing DMS signs will be replaced with full color 20 MM pixel DMS. Fiber will be deployed throughout the proposed interchange. There will be a fiber demarcation point that will allow the Port Authority to connect to the network in order to have access to the camera views. A Vehicle Detection System (VDS) will be provided to collect speed, occupancy, and volume

traffic data along the ramps to evaluate the traffic entering and exiting the Port. And there will be a fiber optic conduit connection for the Port and the Que Warning system.

During the design phase of the S.R. 401 project, the need for ramp signaling for the ramp that ties into S.R. 528 WB exit will be evaluated, as well as the need for Connected Vehicle Road Side Units (RSU's) to see if these need to be mounted to proposed DMS sign structures. The completed S.R. 401 Concept of Operations is under separate cover, and it ensures that the concept fits appropriately to the design plans for Phase II ITS plans for FPID 407402-4-52-01 that were developed for the S.R. 528 corridor.

The Parsons project team is currently developing high level physical and logical network diagrams and if there are any median openings, wrong way driving technology will be implemented.

6.4 Permits Required

The Environmental Permits anticipated for this project are summarized below:

1. Bridge Permit – U.S. Coast Guard (USCG)
2. Section 408 Authorization – U.S. Army Corps of Engineers (USACE)
3. Section 404 - USACE/FDEP
4. Environmental Resource Permit (ERP) – St. Johns River Water Management District (SJRWMD)

6.5 Cost Estimates

Table 6-10 includes a summary of estimated project costs which includes design, construction, CEI, utility, right-of-way, and environmental mitigation costs.

Table 6-6-10: Estimated Project Cost

Construction	$130.0 M
Design/CEI [1]	$28.6 M
Right-of-Way	$0
Utility	TBD
Environmental Mitigation [2]	TBD
Total Project Cost	$158.6 M

[1] *Based on the following:*
- *Design = 10% of Construction Cost*
- *CEI = 12% of Construction Cost*

[2] *Environmental Mitigation Cost to be determined during the Final Design Phase*

[3] *Contingency = 20%*

Appendix A | Conceptual Design Plans

BEGIN PROJECT
FPID 444787-1-22-01
STA. 6+00.00

SR 528 PROJECT
FINANCIAL PROJECT ID: 407402-4-52-01
(WORK DONE BY OTHERS)

PT STA. 768+68.33

SR 528

770

PC STA. 212+16.18

SR 401

CURVE BL_401_1

10

215

15

PT STA. 9+55.47

PC STA. 5+59.87

LA R/W LINE

CURVE DATA BL_401_1
PI STA. = 7+67.76
Δ = 43° 30' 19" (RT)
D = 10° 59' 50"
T = 207.89
L = 395.60
R = 521.00
PC STA. = 5+59.87
PT STA. = 9+55.47
e = 0.073

LEGEND:

PROPOSED ROADWAY

MATCHLINE STA. 519+50.00

520

RAMP E

CURVE DATA BL_RMP_E2
PI STA. = 522+37.18
Δ = 86° 38' 42" (LT)
D = 6° 01' 52"
T = 895.94
L = 1,436.63
R = 950.00
PC STA. = 513+41.24
PT STA. = 527+77.87
e = 0.083

1" = 100'

BEGIN
RETAINING WALL
STA. 520+00.00

LA R/W LINE

RETAINING WALL

℄ CONST. RAMP E

CURVE BL_RMP_E2

CURVE DATA SB_INSIDE_EOP1
PI STA. = 214+77.00
Δ = 3° 53' 18" (LT)
D = 0° 44' 45"
T = 260.82
L = 521.44
R = 7,683.50
PC STA. = 212+16.18
(12+16.18, 0.00' (LT) ℄ SURVEY)
PT STA. = 217+37.62
(17+37.22, 17.69' (LT) ℄ SURVEY)
e = NC

MATCHLINE STA. 525+50.00

BEGIN
RETAINING WALL
STA. 13+60.00

CURVE SB_INSIDE_EOP1

℄ SURVEY SR 401

RETAINING WALL

RETAINING WALL

BEGIN
RETAINING WALL
STA. 13+60.00

MATCHLINE STA. 17+00.00

℄ SURVEY SR 401 STA. 12+01.00 =
℄ SURVEY SR 528 STA. 772+20.08

SR 528

775

℄ SURVEY SR 528

PC STA. 777+25.36

CURVE BL_RMP_H2

MATCHLINE STA. 814+50.00

RAMP H

CURVE DATA BL_RMP_H2
PI STA. = 815+31.82
Δ = 71° 47' 22" (RT)
D = 7° 07' 03"
T = 582.61
L = 1,008.64
R = 805.00
PC STA. = 809+49.21
PT STA. = 819+57.85
e = 0.090

℄ CONST. RAMP H

RETAINING WALL

LA R/W LINE

BEGIN
RETAINING WALL
STA. 811+00.00

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ALEJANDRO A. BARRIOS, P.E.
P.E. LICENSE NO. 75972
PARSONS TRANSPORTATION GROUP, INC.
201 E. PINE STREET, SUITE 900
ORLANDO, FL 32801
PHONE: (407) 702-6800

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 401	BREVARD	444787-1-22-01

ROADWAY PLANS

SHEET NO. 6

CURVE DATA BL_RMP_E2
PI STA. = 522+97.18
Δ = 86° 38' 42" (LT)
D = 6° 01' 52"
T = 895.94
L = 1,436.63
R = 950.00
PC STA. = 513+41.24
PT STA. = 527+77.87
e = 0.083

CURVE DATA BL_RMP_E1
PI STA. = 214+77.00
Δ = 3° 53' 18" (LT)
D = 0° 44' 45"
T = 260.82
L = 521.44
R = 7,683.50
PC STA. = 212+16.18
(12+16.18, 0.00' (LT) ℄ SURVEY)
PT STA. = 217+37.62
(17+37.22, 17.69' (LT) ℄ SURVEY)
e = NC

CURVE DATA BL_RMP_E3
PI STA. = 220+74.05
Δ = 3° 53' 18" (RT)
D = 0° 44' 45"
T = 260.82
L = 521.44
R = 7,683.50
PC STA. = 218+13.21
(18+12.64, 22.81' (LT) ℄ SURVEY)
PT STA. = 223+34.65
(23+33.68, 40.50' (LT) ℄ SURVEY)
e = NC

1" = 100'

CURVE BL_RMP_E2
MULLET RD.
MATCHLINE STA. 522+50.00
CURVE SB_INSIDE_EOP1
RETAINING WALL
RAMP E
525
END RETAINING WALL STA. 525+24.25
PT STA. 217+37.62
END RETAINING WALL STA. 525+47.50
END RETAINING WALL STA. 19+22.50
BEGIN APPROACH SLAB STA. 19+22.50
END APPROACH SLAB
BEGIN BRIDGE STA. 19+52.50
℄ CONST. RAMP E
PT STA. 527+77.87
CURVE SB_INSIDE_EOP2
LA R/W LINE
℄ SURVEY SR 401
CANAVERAL BARGE CANAL
CURVE NB_INSIDE_EOP1
LA R/W LINE
MATCHLINE STA. 17+00.00
220
20
25
N 0° 20' 29" W
SR 401
MATCHLINE STA. 29+50.00
RETAINING WALL
END RETAINING WALL STA. 19+00.00
PT STA. 218+13.21
PT STA. 223+34.65
PC STA. 328+25.24
PI STA. 29+40.85
Δ = 2° 16' 05" (LT)
RETAINING WALL
RETAINING WALL
RAMP H
815
CURVE BL_RMP_H2
℄ CONST. RAMP H
PT STA. 819+57.85
END RETAINING WALL STA. 19+22.50
LA R/W LINE
MATCHLINE STA. 814+50.00
+79.78
175.05' RT
+79.59
224.24' RT
END RETAINING WALL STA. 816+84.00
MULLET RD.
CANAVERAL BARGE CANAL

CURVE DATA BL_RMP_H2
PI STA. = 815+31.82
Δ = 71° 47' 22" (RT)
D = 7° 07' 03"
T = 582.61
L = 1,008.64
R = 805.00
PCC STA. = 809+49.21
PT STA. = 819+57.85
e = 0.090

LEGEND:
PROPOSED ROADWAY
PROPSOED BRIDGE

CURVE DATA NB_INSIDE_EOP1
PI STA. = 332+30.61
Δ = 6° 02' 24" (LT)
D = 0° 44' 45"
T = 405.37
L = 809.99
R = 7,683.50
PC STA. = 328+25.24
(28+25.24, 44.50' (RT) ℄ SURVEY)
PT STA. = 336+35.23
(36+33.11, 29.27' (RT) ℄ SURVEY)
e = NC

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

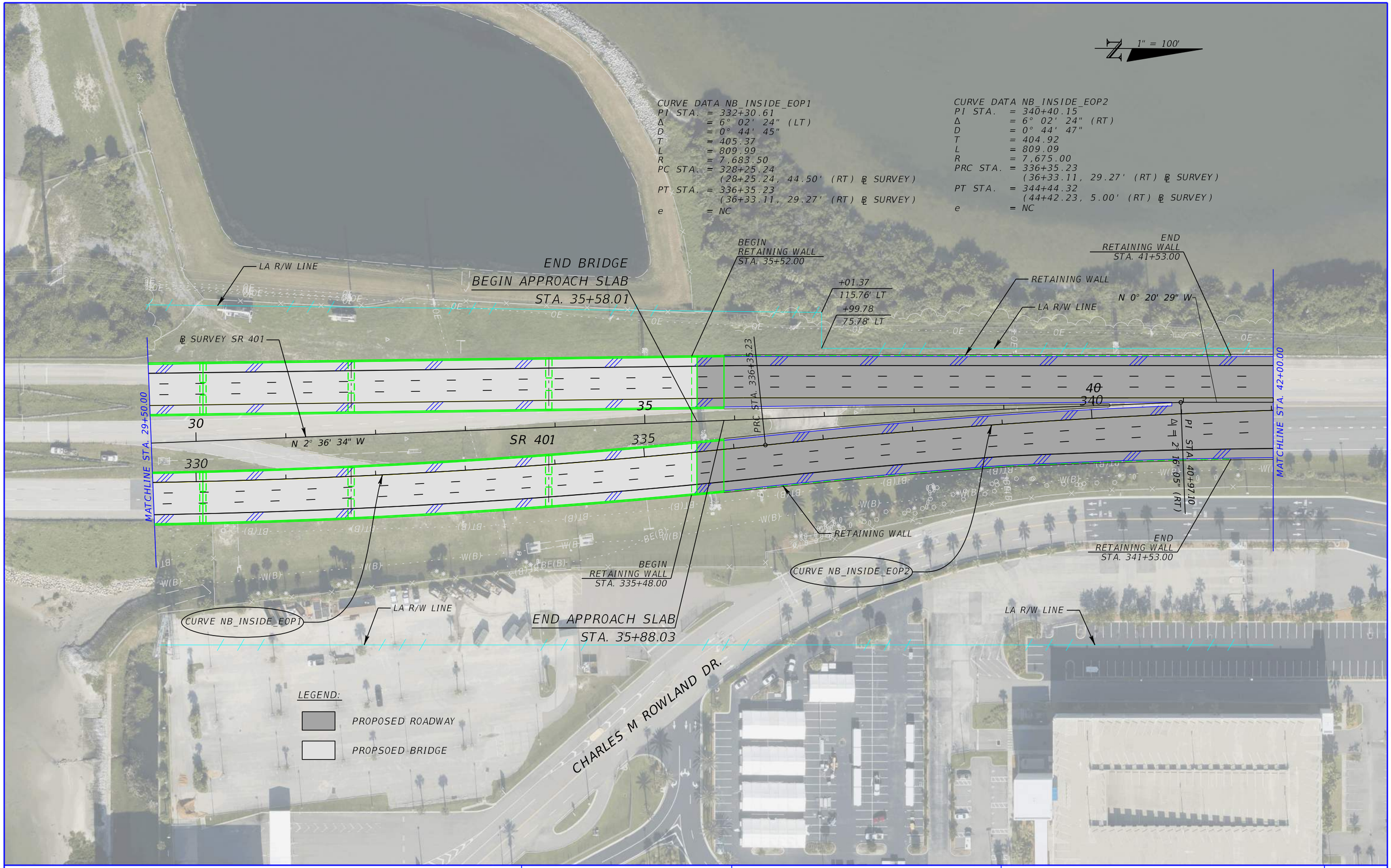
ALEJANDRO A. BARRIOS, P.E.
P.E. LICENSE NO. 75972
PARSONS TRANSPORTATION GROUP, INC.
201 E. PINE STREET, SUITE 900
ORLANDO, FL 32801
PHONE: (407) 702-6800

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 401	BREVARD	444787-1-22-01

ROADWAY PLANS

SHEET NO. 7



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ALEJANDRO A. BARRIOS, P.E.
P.E. LICENSE NO. 75972
PARSONS TRANSPORTATION GROUP, INC.
201 E. PINE STREET, SUITE 900
ORLANDO, FL 32801
PHONE: (407) 702-6800

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 401	BREVARD	444787-1-22-01

ROADWAY PLANS

SHEET NO. 8

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

CURVE DATA NB_INSIDE_EOP2
PI STA. = 340+40.15
Δ = 6° 02' 24" (RT)
D = 0° 44' 47"
T = 404.92
L = 809.09
R = 7,675.00
PRC STA. = 336+35.23
(36+33.11, 29.27' (RT) ℄ SURVEY)
PT STA. = 344+44.32
(44+42.23, 5.00' (RT) ℄ SURVEY)
e = NC

1" = 100'

LA R/W LINE

℄ SURVEY SR 401

CHARLES M ROWLAND DR.

R/W LINE

MATCHLINE STA. 42+00.00

45

N 0° 20' 29" W

PT STA. 344+44.32

SR 401

+34.66
60.00' RT

CURVE NB_INSIDE_EOP2

CHARLES M ROWLAND DR.

R/W LINE

END PROJECT
FPID 444787-1-22-01
STA. 45+12.50

R/W LINE

+34.66
270.00' RT

LA R/W LINE

LEGEND:

PROPOSED ROADWAY

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ALEJANDRO A. BARRIOS, P.E.
P.E. LICENSE NO. 75972
PARSONS TRANSPORTATION GROUP, INC.
201 E. PINE STREET, SUITE 900
ORLANDO, FL 32801
PHONE: (407) 702-6800

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 401	BREVARD	444787-1-22-01

ROADWAY PLANS

SHEET NO. 9

Appendix B | Typical Section Package

STATE OF FLORIDA

DEPARTMENT OF TRANSPORTATION

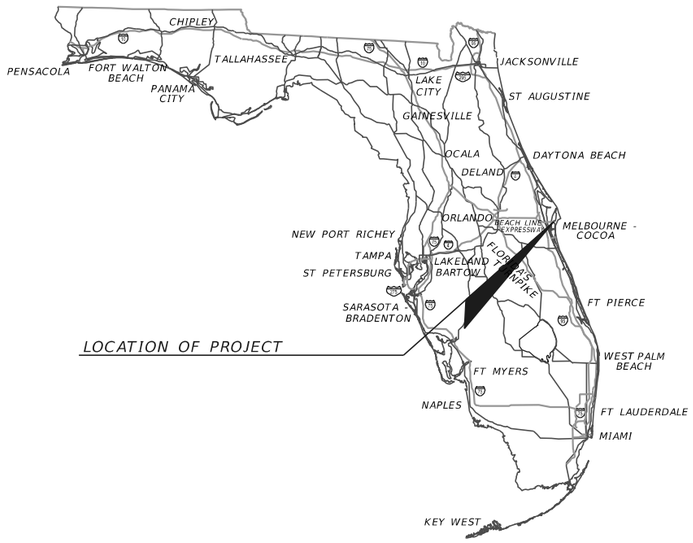
TYPICAL SECTION PACKAGE

FINANCIAL PROJECT ID 444787-1-22-01

BREVARD COUNTY (70080)

STATE ROAD NO. 401

SR 401 BRIDGE REPLACEMENT



FDOT DISTRICT DESIGN ENGINEER

DocuSigned by: Jeffrey Ciccarello E49D9D8820CD4A2...

03/09/2023 | 5:49 PM EST

CONCURRING WITH:
TYPICAL SECTION ELEMENTS
TARGET SPEED
DESIGN AND POSTED SPEEDS

FDOT DISTRICT TRAFFIC OPERATIONS ENGINEER

DocuSigned by: Jim Wood 668E396FACE9466...

03/09/2023 | 11:13 AM EST

CONCURRING WITH:
TARGET SPEED
DESIGN AND POSTED SPEEDS

FDOT DISTRICT INTERMODAL SYSTEMS DEVELOPMENT MANAGER

DocuSigned by: Kellie Smith FA179EF3C91646C...

03/09/2023 | 11:16 AM EST

CONCURRING WITH:
CONTEXT CLASSIFICATION
TARGET SPEED

FDOT DISTRICT STRUCTURES DESIGN ENGINEER

DocuSigned by: Gary Skofronick 8BEAB116F69C4ED...

03/09/2023 | 1:23 PM EST

CONCURRING WITH:
TYPICAL SECTION ELEMENTS

FHWA TRANSPORTATION ENGINEER

N/A

CONCURRING WITH:
TYPICAL SECTION ELEMENTS

LOCAL TRANSPORTATION ENGINEER

N/A

CONCURRING WITH:
TYPICAL SECTION ELEMENTS

NOT USED

CONCURRING WITH:

NOT USED

CONCURRING WITH:

PROJECT LOCATION URL:	https://goo.gl/maps/bsHKsjs1aAQM5wWo9
PROJECT LIMITS:	BEGIN MP 4.064 - END MP 4.805
EXCEPTIONS:	NONE
BRIDGE LIMITS:	BR#700030 MP 4.424 - MP 4.484 BR#700031 MP 4.424 - MP 4.484 BR#700117 MP 4.424 - MP 4.484 BR#70XXXX MP 4.321 - MP 4.625
RAILROAD CROSSING:	NONE

APPROVED BY:

BRIAN J. FLYNN LICENSE No 48071 STATE OF FLORIDA PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY

ON THE DATE ADJACENT TO THE SEAL

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONICS COPIES.

PARSONS TRANSPORTATION GROUP, INC.
201 EAST PINE STREET, SUITE 900
ORLANDO, FL 32801
BRIAN J. FLYNN, P.E. NO. 48071

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR THE FOLLOWING SHEETS IN ACCORDANCE WITH RULE 61G15-23.004, F.A.C.

INDEX OF SHEETS

SHEET NO. 1

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	(X)	C3C : SUBURBAN COMM.
( )	C2 : RURAL	( )	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY	( )	N/A : FL GREENBOOK

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	( )	LOCAL
(X)	MINOR ARTERIAL		

HIGHWAY SYSTEM

- (X) NATIONAL HIGHWAY SYSTEM
- (X) STRATEGIC INTERMODAL SYSTEM
- (X) STATE HIGHWAY SYSTEM
- ( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

- ( ) 1 - FREEWAY
- ( ) 2 - RESTRICTIVE w/Service Roads
- (X) 3 - RESTRICTIVE w/660 ft. Connection Spacing
- ( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
- ( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
- ( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
- ( ) 7 - BOTH MEDIAN TYPES

CRITERIA

- (X) NEW CONSTRUCTION / RECONSTRUCTION
- ( ) RESURFACING (LA FACILITIES)
- ( ) RRR (ARTERIALS & COLLECTORS)

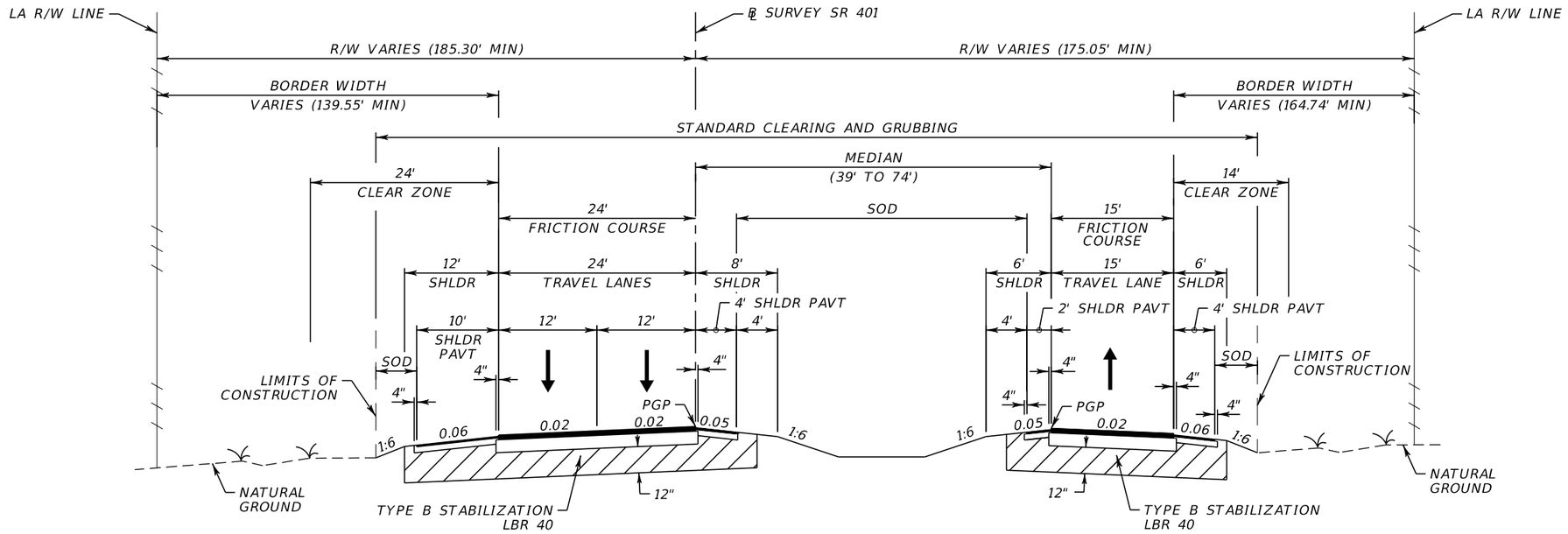
POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

Project Design Variation Memorandum

1. Median Width

NOTE: A 6% MAXIMUM GRADE IS PROVIDED ON THE APPROACHES TO THE BRIDGE. A DESIGN VARIATION WILL BE REQUIRED FOR THIS ELEMENT.

TYPICAL SECTION No. 1



TYPICAL SECTION
SR 401 (SOUTH OF CANAVERAL BARGE CANAL)
STA 6+00.00 TO STA 19+52.50

NOT TO SCALE

TRAFFIC DATA

CURRENT YEAR = 2019 AADT = 6,900
ESTIMATED OPENING YR.= 2030 AADT = 12,600
ESTIMATED DESIGN YR. = 2050 AADT = 15,800
K = 9% D = 56% T = 18% (24 HOUR)
DESIGN HOUR T = 9%
TARGET SPEED = 45 MPH
DESIGN SPEED = 45 MPH
POSTED SPEED = 45 MPH

FINANCIAL PROJECT ID	SHEET NO.
444787-1-22-01	2

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	(X)	C3C : SUBURBAN COMM.
( )	C2 : RURAL	( )	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY	( )	N/A : FL GREENBOOK

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	( )	LOCAL
(X)	MINOR ARTERIAL		

HIGHWAY SYSTEM

- (X) NATIONAL HIGHWAY SYSTEM
- (X) STRATEGIC INTERMODAL SYSTEM
- (X) STATE HIGHWAY SYSTEM
- ( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

- ( ) 1 - FREEWAY
- ( ) 2 - RESTRICTIVE w/Service Roads
- (X) 3 - RESTRICTIVE w/660 ft. Connection Spacing
- ( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
- ( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
- ( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
- ( ) 7 - BOTH MEDIAN TYPES

CRITERIA

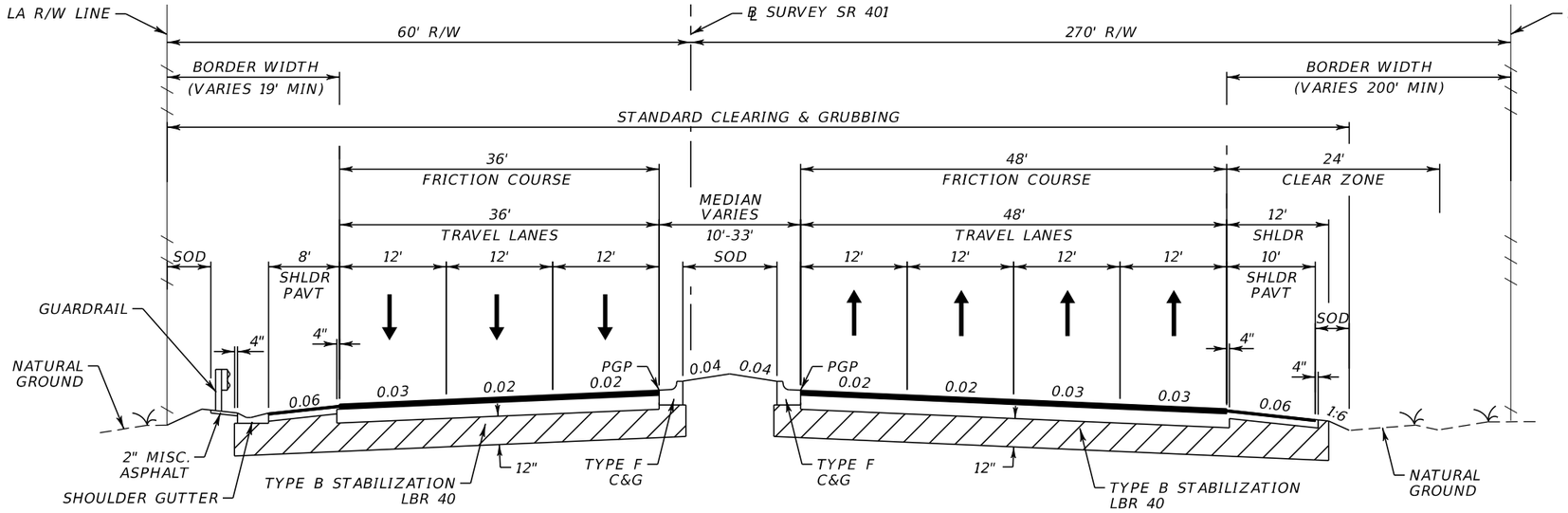
- (X) NEW CONSTRUCTION / RECONSTRUCTION
- ( ) RESURFACING (LA FACILITIES)
- ( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

Project Design Variation Memorandum
1. Median Width

NOTE: A 6% MAXIMUM GRADE IS PROVIDED ON THE APPROACHES TO THE BRIDGE. A DESIGN VARIATION WILL BE REQUIRED FOR THIS ELEMENT.

TYPICAL SECTION No. 2



TYPICAL SECTION
SR 401 (NORTH OF CANAVERAL BARGE CANAL)
STA 35+58.01 TO STA 45+12.50

NOT TO SCALE

TRAFFIC DATA

CURRENT YEAR = 2019 AADT = 13,200
ESTIMATED OPENING YR.= 2030 AADT = 24,000
ESTIMATED DESIGN YR. = 2050 AADT = 30,000
K = 9% D = 52% T = 19% (24 HOUR)
DESIGN HOUR T = 9%
TARGET SPEED = 45 MPH
DESIGN SPEED = 45 MPH
POSTED SPEED = 45 MPH

FINANCIAL PROJECT ID	SHEET NO.
444787-1-22-01	3

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	(X)	C3C : SUBURBAN COMM.
( )	C2 : RURAL	( )	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY	( )	N/A : FL GREENBOOK

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	( )	LOCAL
(X)	MINOR ARTERIAL		

HIGHWAY SYSTEM

- (X) NATIONAL HIGHWAY SYSTEM
- (X) STRATEGIC INTERMODAL SYSTEM
- (X) STATE HIGHWAY SYSTEM
- ( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

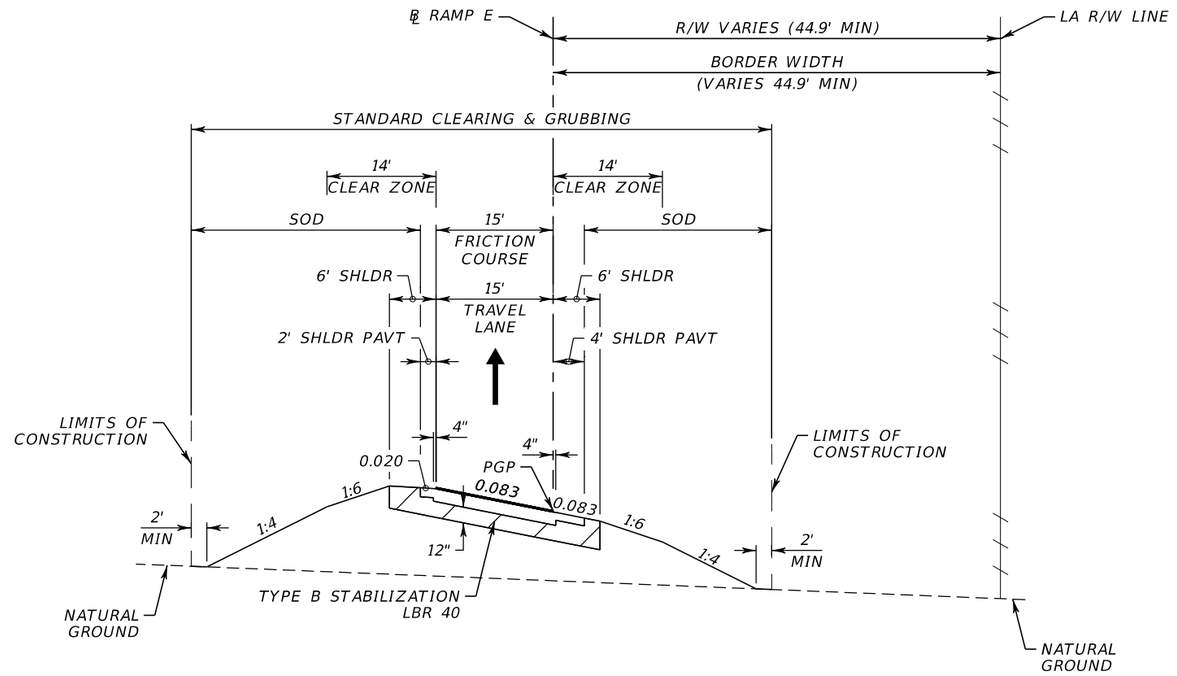
- ( ) 1 - FREEWAY
- ( ) 2 - RESTRICTIVE w/Service Roads
- (X) 3 - RESTRICTIVE w/660 ft. Connection Spacing
- ( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
- ( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
- ( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
- ( ) 7 - BOTH MEDIAN TYPES

CRITERIA

- (X) NEW CONSTRUCTION / RECONSTRUCTION
- ( ) RESURFACING (LA FACILITIES)
- ( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

TYPICAL SECTION No. 3



TYPICAL SECTION
SB EXIT RAMP E
STA 506+91.20 TO STA 527+77.87

NOT TO SCALE

TRAFFIC DATA

CURRENT YEAR = 2019 AADT = 3,700
ESTIMATED OPENING YR.= 2030 AADT = 6,700
ESTIMATED DESIGN YR. = 2050 AADT = 8,500
K = 9% D = 100% T = 26% (24 HOUR)
DESIGN HOUR T = 13%
TARGET SPEED = 45 MPH
DESIGN SPEED = 45-50 MPH
POSTED SPEED = N/A

FINANCIAL PROJECT ID	SHEET NO.
444787-1-22-01	4

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	(X)	C3C : SUBURBAN COMM.
( )	C2 : RURAL	( )	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY	( )	N/A : FL GREENBOOK

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	( )	LOCAL
(X)	MINOR ARTERIAL		

HIGHWAY SYSTEM

- (X) NATIONAL HIGHWAY SYSTEM
- (X) STRATEGIC INTERMODAL SYSTEM
- (X) STATE HIGHWAY SYSTEM
- ( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

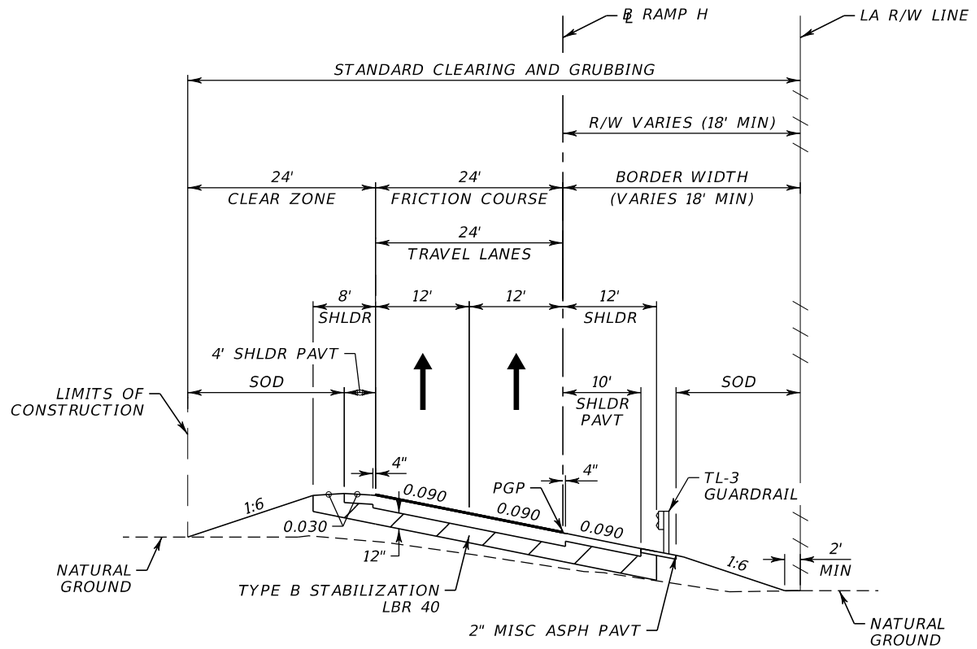
- ( ) 1 - FREEWAY
- ( ) 2 - RESTRICTIVE w/Service Roads
- (X) 3 - RESTRICTIVE w/660 ft. Connection Spacing
- ( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
- ( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
- ( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
- ( ) 7 - BOTH MEDIAN TYPES

CRITERIA

- (X) NEW CONSTRUCTION / RECONSTRUCTION
- ( ) RESURFACING (LA FACILITIES)
- ( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

TYPICAL SECTION No. 4



TYPICAL SECTION
NB ENTRANCE RAMP H
STA 806+75.54 TO STA 819+57.85

NOT TO SCALE

TRAFFIC DATA

CURRENT YEAR = 2019 AADT = 2,600
ESTIMATED OPENING YR.= 2030 AADT = 4,700
ESTIMATED DESIGN YR. = 2050 AADT = 5,700
K = 9% D = 100% T = 12% (24 HOUR)
DESIGN HOUR T = 6%
TARGET SPEED = 45 MPH
DESIGN SPEED = 45-50 MPH
POSTED SPEED = N/A MPH

FINANCIAL PROJECT ID	SHEET NO.
444787-1-22-01	5

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( )	C1 : NATURAL	(X)	C3C : SUBURBAN COMM.
( )	C2 : RURAL	( )	C4 : URBAN GENERAL
( )	C2T : RURAL TOWN	( )	C5 : URBAN CENTER
( )	C3R : SUBURBAN RES.	( )	C6 : URBAN CORE
( )	N/A : L.A. FACILITY	( )	N/A : FL GREENBOOK

FUNCTIONAL CLASSIFICATION

( )	INTERSTATE	( )	MAJOR COLLECTOR
( )	FREEWAY/EXPWY.	( )	MINOR COLLECTOR
( )	PRINCIPAL ARTERIAL	( )	LOCAL
(X)	MINOR ARTERIAL		

HIGHWAY SYSTEM

(X) NATIONAL HIGHWAY SYSTEM
(X) STRATEGIC INTERMODAL SYSTEM
(X) STATE HIGHWAY SYSTEM
( ) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
(X) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
( ) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
( ) 7 - BOTH MEDIAN TYPES

CRITERIA

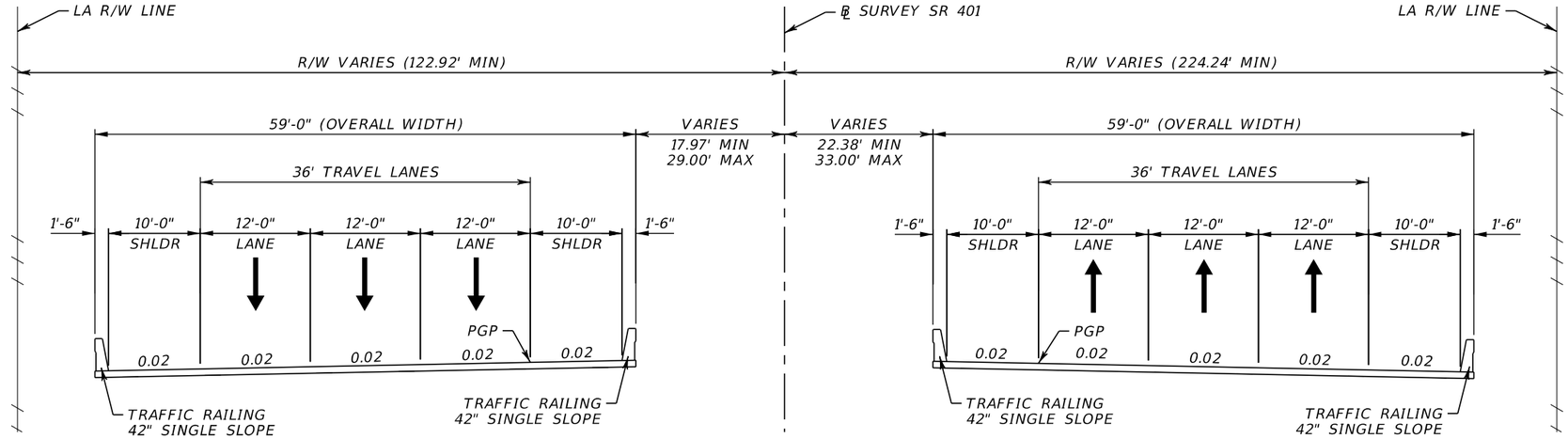
(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTION:

Project Design Variation Memorandum
1. Median Width

NOTE: A 6% MAXIMUM GRADE IS PROVIDED ON THE APPROACHES TO THE BRIDGE. A DESIGN VARIATION WILL BE REQUIRED FOR THIS ELEMENT.

TYPICAL SECTION No. 5



TYPICAL SECTION
SR 401 OVER CANAVERAL BARGE CANAL
BRIDGE NO. 70XXXX
STA 19+52.50 TO STA 35+58.01

NOT TO SCALE

TRAFFIC DATA

CURRENT YEAR = 2019 AADT = 13,200
ESTIMATED OPENING YR.= 2030 AADT = 24,000
ESTIMATED DESIGN YR. = 2050 AADT = 30,000
K = 9% D = 52% T = 19% (24 HOUR)
DESIGN HOUR T = 9%
TARGET SPEED = 45 MPH
DESIGN SPEED = 45 MPH
POSTED SPEED = 45 MPH

FINANCIAL PROJECT ID	SHEET NO.
444787-1-22-01	6

Appendix C | Correspondence

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Seventh District

909 S. E. 1st Avenue (Rm 432)
Miami, FL 33131
Staff Symbol: (dpb)
Phone: (305) 415-6932
Lisia.J.Kowalczyk@uscg.mil

16591/3116
September 12, 2022

Mary McGehee
Project Manager
Florida Department of Transportation – District Five
719 South Woodland Boulevard
Deland, Florida 32120
Via email: Mary.McGehee@dot.state.fl.us

Odalys Delgado, AICP
Florida Practice Lead
Planning and Project Development
7600 Corporate Center Drive, Suite 104
Miami, Florida 33126
Via email: Odalys.delgado@parsons.com

Dear Ms. McGehee and Ms. Delgado:

In October 2021, the U.S. Coast Guard received a navigational impact report technical memorandum for the replacement of the SR 401 bridges, which cross the Canaveral Barge Canal located in Brevard County. The NIR was prepared by Bermello Ajamil & Partners on behalf of the Florida Department of Transportation (FDOT) District Five. A supplemental memo dated 8 April 2022 was also provided. Since then, additional coordination occurred with area marinas suspected to harbor vessels that could be impacted by the proposed fixed Canaveral Bridge.

Based on the additional information, a reevaluation of the preliminary clearance determination has been made for the bridge structure associated with the proposed project. The recommended/preferred build alternative from the Coast Guard prospective would be a bascule bridge(s) with closed vertical clearance greater than the existing bascule bridges. However, given the information provided in the submitted study, supplemental information, and the mitigation offered through available marina slips east of the proposed bridge, a vertical fixed clearance of 65 feet above mean high water would be adequate to meet the reasonable needs of present and prospective navigation at this location.

A note regarding guide clearances from the U.S. Coast Guard Office of Bridge Programs' webpage: *Guide Clearances are defined as the navigational clearances established by the Coast Guard for a particular navigable water of the United States which will ordinarily receive favorable consideration under the bridge permitting process (33 CFR Chapter 1, Subchapter J - Bridges) as providing for the reasonable needs of navigation. They are not intended to be regulatory in nature or to form a legal basis for approving or denying a bridge permit application. Under the circumstances of a particular case, greater or lesser clearances for a proposed bridge may be required or approved as meeting the reasonable needs of navigation for that particular location. For example, the particular character of the waterway and topography at the proposed location may justify a departure from the clearances specified for the waterway in the list of Guide Clearances.*

Please note that this preliminary determination does not constitute an approval or final agency action. In accordance with regulation, the Coast Guard can only make a final determination after processing a complete bridge permit application.

To complete the Bridge Permit Application, please refer to the Coast Guard Bridge Permit Application Guide located at https://go.usa.gov/xRFk2 (case sensitive). Please feel free to contact me with any questions or comments. We look forward to continuing to work with you both to move this project forward.

Sincerely,

Lisia Kowalczyk
USCG D7 Bridge Management Specialist

Florida Department of Transportation

RON DESANTIS
GOVERNOR

719 South Woodland Boulevard
DeLand, Florida 32720-6834

KEVIN J. THIBAULT, P.E.
SECRETARY

February 16, 2022

Timothy A. Parsons, Ph.D.,
Director and State Historic Preservation Officer
Florida Division of Historical Resources
Florida Department of State
R.A. Gray Building
500 South Bronough Street
Tallahassee, Florida 32399-0250

Attn: Mr. Clete Rooney, Transportation Compliance Review Program

RE: Cultural Resource Assessment Survey
SR 401 Bridge Replacement Project Development and Environment (PD&E) Study
Brevard County, Florida
Financial Management No.: 444787-1

Dear Dr. Parsons,

Enclosed please find one copy of the report titled *Cultural Resource Assessment Survey in Support of the SR 401 Bridge Replacement PD&E Study Brevard County, Florida*. The FDOT District 5 is conducting a PD&E Study for proposed replacement of the three existing State Road (SR) 401 bascule bridges. The study alternatives consist of the No Build and three Build alternatives that would carry traffic northbound and southbound along the existing bridge alignment - Mid-Level Movable Bascule Bridge, Mid-Level Movable Lift Bridge, and High-Level Fixed Bridge. The Mid-Level Movable Bascule Bridge would replace the current three bascule bridges with two bascule bridges, the Mid-Level Movable Lift Bridge would replace the current three bascule bridges with two vertical-lift bridges, and the High-Level Fixed Bridge would replace the current three bascule bridges with two fixed span bridges. Additional improvements include roadway widening and/or realignment of existing ramps. The bridge and associated roadway improvements will take place within the existing right-of-way; no additional right-of-way is proposed.

To encompass all potential improvements, the Area of Potential Effects (APE) was defined to include the existing right-of-way where improvements are proposed, including the three bridges spanning the Canaveral Barge Canal, as well as the right-of-way along the SR 401/SR A1A interchange with SR 528 Causeway for a total length of approximately 0.7 miles of SR 401/SR A1A and 0.5 miles of SR 528 Causeway. The APE was extended from the right-of-way to include adjacent properties up to 100 meters (330 feet). Given the absence of natural soils within the entire

project right-of-way, no archaeological survey was conducted. The historic structure survey was conducted within the entire APE.

The purpose of the survey was to locate, identify, and bound any archaeological resources, historic structures, and potential districts within the project's APE and assess their potential for listing in the National Register of Historic Places (NRHP). This study was conducted to comply with Public Law 113-287 (Title 54 U.S.C.), which incorporates the provisions of the National Historic Preservation Act (NHPA) of 1966, as amended, and the Archeological and Historic Preservation Act of 1974, as amended. The study also meets the regulations for implementing NHPA Section 106 found in 36 CFR Part 800 (*Protection of Historic Properties*). This study also complies with Chapter 267 of the Florida Statutes and Rule Chapter 1A-46, Florida Administrative Code. All work was performed in accordance with Part 2, Chapter 8 of the FDOT's PD&E Manual (revised July 2020) as well as the Florida Division of Historical Resources' (FDHR) recommendations for such projects as stipulated in the FDHR's *Cultural Resource Management Standards & Operations Manual, Module Three: Guidelines for Use by Historic Preservation Professionals*. The Principal Investigator for this project meets the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716-42).

The architectural survey resulted in the identification of five previously recorded historic resources within the SR 401 Bridge Replacement PD&E Study APE. The previously recorded historic resources include one resource group, one linear resource, and three bridges.

One previously recorded group, the Canaveral Lock (8BR02936), was determined eligible for listing in the National Register of Historic Places (NRHP) on June 5, 2012, under Criterion A for its association with the Florida space industry and the National Aeronautics and Space Administration (NASA), as well as its maritime transportation associations. Based on the results of the current study, 8BR02936 is recommended to remain NRHP-eligible. It is the opinion of the District that the improvements proposed at this location (replacement of bridges) are in keeping with the modernized SR 401 corridor and will not diminish Resource 8BR02936 such that its NRHP-eligible status would be compromised. It is the resource's associations with NASA and maritime transportation that has contributed to its NRHP-eligible status, and as the project poses no alterations to these associations nor the integrity of the resource itself, the proposed project has no potential to adversely affect the NRHP eligibility of the Canaveral Lock (8BR02936).

The remaining four resources within the APE (8BR03009, 8BR03010, 8BR03394, and 8BR03395) are recommended ineligible for listing in the NRHP due to factors such as a lack of engineering and/or architectural distinction and a lack of significant historical associations. The SHPO previously concurred that these four resources are ineligible for inclusion in the NRHP on February 17, 2017, and July 8, 2019. No further architectural history work is recommended.

Based on the results of this study, it is the opinion of the District that the proposed undertaking will have no adverse effect on NRHP-listed or -eligible historic properties. No further work is recommended.

I respectfully request your concurrence with the findings of the enclosed report.

If you have any questions or need further assistance, please contact Catherine Owen, District Cultural Resource Coordinator, at (386) 943-5383 or me at (386) 943-5411.

Sincerely,

William G. Walsh
Environmental Manager
FDOT, District Five

cc. Deena Woodward, Cultural and Historic Resource Specialist, FDOT OEM

The Florida State Historic Preservation Officer finds the attached Cultural Resource Assessment Survey Report complete and sufficient and ☑ concurs / ☐ does not concur with the recommendations and findings provided in this cover letter for SHPO/FDHR Project File Number 2021-5217. Or, the SHPO finds the attached document contains _____ insufficient information.

In accordance with the Programmatic Agreement among the ACHP, SHPO and FDOT Regarding Implementation of the Federal-Aid Highway Program in Florida, if providing concurrence with a finding of No Historic Properties Affected for a project as a whole, or to No Adverse Effect on a specific historic property, SHPO shall presume that FDOT may approve the project as de minimis use under Section 4(f) under 23 CFR 774.

SHPO Comments:

Kelly L Chase For

Timothy A. Parsons, PhD, Director
Florida Division of Historical Resources

3/1/2022
Date

May 16, 2022

Ms. Mary McGehee
Project Manager
Florida Department of Transportation – District 5
719 South Woodland Boulevard
Deland, Florida 32120
Via email: Mary.McGehee@dot.state.fl.us

Ms. Odalys Delgado, AICP
Florida Practice Lead
Planning and Project Development
7600 Corporate Center Drive, Suite 104
Miami, Florida 33126
Via email: Odalys.Delgado@parsons.com

Dear Ms. McGehee and Ms. Delgado:

The Canaveral Port Authority acknowledges the mission of the Florida Department of Transportation (FDOT) and thanks the Agency for its commitment to provide modern, safe, and efficient roadways and bridges throughout our state. Port Canaveral is particularly grateful to FDOT for its efforts to replace the State Road 401 bridges efficiently and expeditiously.

For decades, Port Canaveral has been an important economic driver for the Space Coast and Central Florida regions delivering billions of dollars in economic prosperity to the region and our entire state. Our Port depends on the viability of the SR 401 bridges for assured access between the Port's northside and southside operations. This bridge which crosses the entrance to the Canaveral Barge Canal is the ***only*** connection that ensures the Port's continuous capability, safety, and security of operations, including cruise and general cargo, commercial space, and unimpeded access to critical fuel supplies for the State of Florida.

The current bascule bridge design of SR 401 is functionally obsolete. Its operation depends on a bridge tender (FDOT personnel) and opens on demand to accommodate vessel traffic. It has proven on multiple occasions to be a single point of failure causing major traffic disruptions, which are a public safety risk, and costly delays in Port operations.

Additionally, it is important to note that State Road 401 roadway and bridges – from the State Road 528 interchange to its end at the entrance to Cape Canaveral Space Force Station – is classified as a Strategic Highway Network (STRAHNET) Connector by the Military Surface Deployment and Distribution Command (SDDC), a U.S. Army Service Component Command supporting U.S. Transportation Command (USTRANSCOM). SDDC's berths are berths located on Port Canaveral's northside providing ocean terminal and commercial and military vessel services to deploy, sustain and redeploy U.S. forces on a global basis.

It is for all the aforesaid reasons the Canaveral Port Authority strongly supports the fixed bridge with 65 feet of vertical clearance as the design option replacement for the existing SR 401 bridges. This design option is consistent with other fixed bridges crossing the channel of the Atlantic Intracoastal Waterway (ICW) in Florida, all of which have a clearance of 65 feet above Mean High Water (MHW) except the Julia Tuttle Causeway in Miami, which has a 56-foot clearance.

Vessels requiring clearance greater than 65 feet that attempt to transit through Port Canaveral to west of the SR 401 bridges have no safe course for navigation once the vessel clears the Canaveral Locks.

With reference to NOAA Nautical Chart 11478 Port Canaveral, a 65-foot overhead power cable crosses the Canaveral Barge Canal near marker 15 and 14A on the North side. The Bennett Memorial Causeway (SR 528) is a fixed bridge with 36-foot overhead clearance on the South side. From the Barge Canal west to the ICW water depth is 8.5 feet, and, as previously stated, the ICW bridges are at 65-foot clearance.

Finally, vessels which require vertical clearance greater than 65 feet can access one of the multiple marinas located east of the SR 401 bridge for berthing or service.

If you should have any questions or wish to further discuss the Port's position on this topic, please feel free to contact me or Diane Luensmann, our VP, Government and Strategic Communications at dluensmann@portcanaveral.com.

Sincerely,

John W. Murray
CEO and Port Director

Canaveral Port Authority
445 Challenger Road, Suite 301, Cape Canaveral FL 32920
321.783.7831 www.portcanaveral.com

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Seventh District

909 S. E. 1st Avenue (Rm 432)
Miami, FL 33131
Staff Symbol: (dpb)
Phone: (305) 415-6932
Lisia.J.Kowalczyk@uscg.mil

16591/3116
September 12, 2022

Mary McGehee
Project Manager
Florida Department of Transportation – District Five
719 South Woodland Boulevard
Deland, Florida 32120
Via email: Mary.McGehee@dot.state.fl.us

Odalys Delgado, AICP
Florida Practice Lead
Planning and Project Development
7600 Corporate Center Drive, Suite 104
Miami, Florida 33126
Via email: Odalys.delgado@parsons.com

Dear Ms. McGehee and Ms. Delgado:

In October 2021, the U.S. Coast Guard received a navigational impact report technical memorandum for the replacement of the SR 401 bridges, which cross the Canaveral Barge Canal located in Brevard County. The NIR was prepared by Bermello Ajamil & Partners on behalf of the Florida Department of Transportation (FDOT) District Five. A supplemental memo dated 8 April 2022 was also provided. Since then, additional coordination occurred with area marinas suspected to harbor vessels that could be impacted by the proposed fixed Canaveral Bridge.

Based on the additional information, a reevaluation of the preliminary clearance determination has been made for the bridge structure associated with the proposed project. The recommended/preferred build alternative from the Coast Guard prospective would be a bascule bridge(s) with closed vertical clearance greater than the existing bascule bridges. However, given the information provided in the submitted study, supplemental information, and the mitigation offered through available marina slips east of the proposed bridge, a vertical fixed clearance of 65 feet above mean high water would be adequate to meet the reasonable needs of present and prospective navigation at this location.

A note regarding guide clearances from the U.S. Coast Guard Office of Bridge Programs' webpage: *Guide Clearances are defined as the navigational clearances established by the Coast Guard for a particular navigable water of the United States which will ordinarily receive favorable consideration under the bridge permitting process (33 CFR Chapter 1, Subchapter J - Bridges) as providing for the reasonable needs of navigation. They are not intended to be regulatory in nature or to form a legal basis for approving or denying a bridge permit application. Under the circumstances of a particular case, greater or lesser clearances for a proposed bridge may be required or approved as meeting the reasonable needs of navigation for that particular location. For example, the particular character of the waterway and topography at the proposed location may justify a departure from the clearances specified for the waterway in the list of Guide Clearances.*

Please note that this preliminary determination does not constitute an approval or final agency action. In accordance with regulation, the Coast Guard can only make a final determination after processing a complete bridge permit application.

To complete the Bridge Permit Application, please refer to the Coast Guard Bridge Permit Application Guide located at https://go.usa.gov/xRFk2 (case sensitive). Please feel free to contact me with any questions or comments. We look forward to continuing to work with you both to move this project forward.

Sincerely,

Lisia Kowalczyk
USCG D7 Bridge Management Specialist

FDOT

Florida Departm

RON DESANTIS
GOVERNOR

605
Tallaha

December 15, 2022

Annie DZiergowski, Deputy Field Supervisor
US Fish and Wildlife Service
North Florida Ecological Services Office
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256-7517

Attention: Mrs. Zakia Williams

RE: Request for Section 7 Informal Consul
SR 401 Bridge Replacement
Brevard County, Florida
Financial Management Number: 444787-1

U.S. Fish and Wildlife Service
Florida Ecological Service Office

FWS Log No. 2023-0035143

The U.S. Fish and Wildlife Service has reviewed the information provided and finds that the proposed action is not likely to adversely affect any federally listed species or designated critical habitat protected by the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 et. seq.). A record of this consultation is on file at the Florida Ecological Service Office.

This fulfills the requirements of section 7 of the Act and further action is not required. If modifications are made to the project, if additional information involving potential effects to listed species becomes available, or if a new species is listed, reinitiation of consultation may be necessary.

JOSE RIVERA Digitally signed by JOSE RIVERA
Date: 2023.01.19 08:23:27 -05'00'

José J. Rivera, Division Supervisor, Environmental Review Date

The Florida Department of Transportation is proposing to replace the SR 401 Bridge over the Canaveral Barge Canal in Brevard County, Florida. As part of the project evaluation, a Natural Resources Evaluation (NRE) has been developed to assess the project for its impacts to wetlands and protected species.

The study area is either partially or wholly within several consultation areas, however, there is no suitable habitat for the following species: Eastern indigo snake (*Drymarchon corais couperi),* Atlantic salt marsh snake (*Nerodia clarkii taeniata)*, piping plover (*Charadrius melodus)*, Rufa red knot (*Calidris canutus rufa),* wood stork (*Mycteria americana)*, Eastern black rail (*Laterallus jamaicensis spp. Jamaicensis),* Florida scrub-jay (*Aphelocoma coerulescens),* Southeastern beach mouse (*Peromyscus polionotus niveiventris),* Carter's mustard (*Warea carteri*), and Lewton's polygala (*Polygala lewtonii*). As there is no suitable habitat and no documented occurrences, it has been determined that the project will have "no effect" on any of these species. Additionally, although impacts to sea turtle species were also evaluated, there is no nesting habitat with the project area. Coordination with National Marine Fisheries Service for the impacts to these species is being initiated.

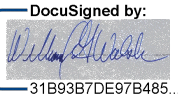
There is one (1) federally protected animal species that could occur within the project area, the West Indian Manatee along with its critical habitat. This species, its critical habitat, and the associated effect determinations, are discussed below:

The Florida manatee is listed as Threatened. Florida manatees utilize coastal waters, bays, estuaries, rivers and occasionally lakes. Manatees are known to utilize the Barge Canal to move to and from the IRL/ocean although none were observed during field reviews. Discussions with the USACE Canaveral Lock staff revealed that they observe manatees traversing the canal and sometimes open the lock to allow manatees through, even though no boats are present. The USFWS Manatee Key (USFWS, 2013) was also reviewed to determine effect. Standard manatee conditions for in-water work will be followed during construction. Based on the key, the likelihood of the presence of manatee, and due to in-water work, FDOT has determined the project "May Affect Not Likely to Adversely Affect" the Florida manatee.

The project is located within the USFWS critical habitat for the Florida manatee, and the west side of the project (IRL) is in an Important Manatee Area (IMA); designated by USFWS. Based on review of the USFWS Manatee Critical Habitat Mapper, the western S.R. 401 bridge appears to be partially located within designated manatee critical habitat. The manatee critical habitat extends westward through the Barge Canal and into the Indian River Lagoon/Banana River. Port Canaveral, to the east of the bridge, is outside the designated critical habitat. Although manatees are known to be present in the Barge Canal, as they move to/from the ocean and Indian River Lagoon, there are no seagrasses for foraging within the Barge Canal and limited other foraging resources (i.e., algae) may be available. No long-term impact to the designated critical manatee habitat will occur. Temporary, short-term impacts due to bridge construction (i.e., removal of existing bridges) are anticipated. The construction of the new bridge will result in 0.09 acres of impacts from the total area of new pilings in the water, however, the total number of pilings in the water is less. Additionally, manatee critical habitat does not appear to extend underneath the entire bridge. Due to nominal permanent impacts (0.09 acres) to critical habitat due to larger pilings and the area under the bridge providing negligible foraging habitat for the manatee, FDOT has determined the project "May Affect Not Likely to Adversely Affect" manatee critical habitat.

We appreciate the coordination effort and input already provided and look forward to continued consultation on this project. If you have any questions, feel free to contact either Heather Chasez at (386) 943-5393, heather.chasez@dot.state.fl.us or me at (386) 943-5411, william.walsh@dot.state.fl.us at your convenience. Thank you for your assistance with this project.

Sincerely,

DocuSigned by:

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William G. Walsh
Environmental Manager
FDOT, District Five