BRIDGE ANALYSIS REPORT

Florida Department of Transportation

District Four

Interstate 95 (I-95) / State Road 9 (SR 9) Project Development and Environment Study

Limits of Project: From South of Hallandale Beach Boulevard (SR 858) to North of Hollywood Boulevard (SR 820)

Broward County, Florida

Financial Management Number: 436903-1-22-02

ETDM Number: 14254

Date: February 2025

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

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1. Introduction

1.1. Project Description

The Florida Department of Transportation (FDOT) District Four is conducting a Project Development and Environment (PD&E) Study for Interstate 95 (I-95) from south of Hallandale Beach Boulevard (SR 858) to north of Hollywood Boulevard (SR 820), a distance of approximately three miles (see **Figure 1.1**). The PD&E Study is proposing improvements to the Hallandale Beach Boulevard, Pembroke Road, and Hollywood Boulevard interchanges. The project is located in Broward County, Florida, and is contained within the municipalities of Hallandale Beach, Pembroke Park, and Hollywood.

I-95 is the primary north-south interstate facility that links all major cities along the Atlantic Seaboard and is one of the most important transportation systems in southeast Florida. I-95 is one of the two major expressways, Florida's Turnpike being the other, that connects major employment centers and residential areas within the South Florida tri-county area. I-95 is part of the State's Strategic Intermodal System (SIS), the National Highway System, and is designated as an evacuation route along the east coast of Florida.

I-95, within the project limits, currently consists of eight general use lanes (four in each direction) and four dynamically tolled express lanes (two in each direction). This segment of I-95 is functionally classified as a Divided Urban Principal Arterial Interstate and has a posted speed limit of 65 miles per hour. The access management classification for this corridor is Class 1.2, Freeway in an existing urbanized area with limited access.

There are three existing full interchanges within the project limits located at Hallandale Beach Boulevard, Pembroke Road, and Hollywood Boulevard. All three roadways are classified as Divided Urban Principal Arterials. Hallandale Beach Boulevard consists of four lanes west of I-95 and six lanes east of I-95. Pembroke Road and Hollywood Boulevard each have six lanes west of I-95 and four lanes east of I-95.

This PD&E Study is evaluating the potential modification of existing entrance and exit ramps serving the three interchanges within the project limits. Widening and turn lane modifications at the ramp terminals were evaluated to facilitate the ramp modifications and improve the access and operation of the interchanges. The purpose of the Bridge

Analysis Report (BAR) is to evaluate bridge structure alternatives associated with the alternatives considered during the PD&E Study.

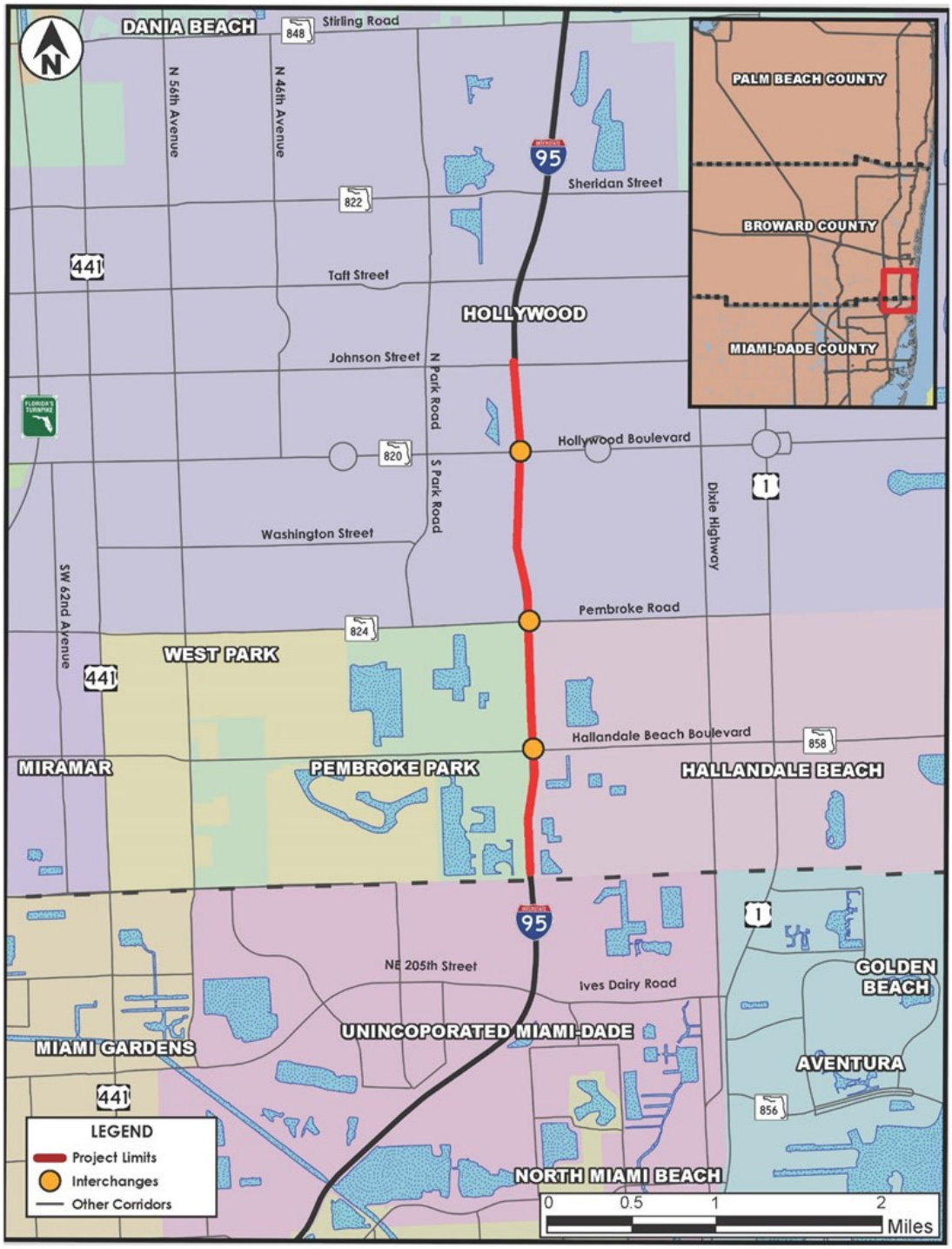


Figure 1.1 Project Location Map

1.2. Existing Condition

The existing I-95 mainline roadway section varies slightly. It consists primarily of four 11-foot wide express lanes (two in each direction) and eight 11-foot to 12-foot wide general use lanes (four in each direction) with 12-foot wide auxiliary lanes at select locations. A 3-foot wide buffer area with pavement markings and express lane markers separates the general use lanes from the express lanes with 5-foot to 12-foot wide inside shoulders, 12-foot wide outside shoulders, and a 2.5-foot wide center barrier wall. One express lane exists in each direction between Miami-Dade County and Hallandale Beach Boulevard in Broward County.

Figures 1.2 – 1.4 show the existing I-95 roadway cross sections within the study limits between interchanges.

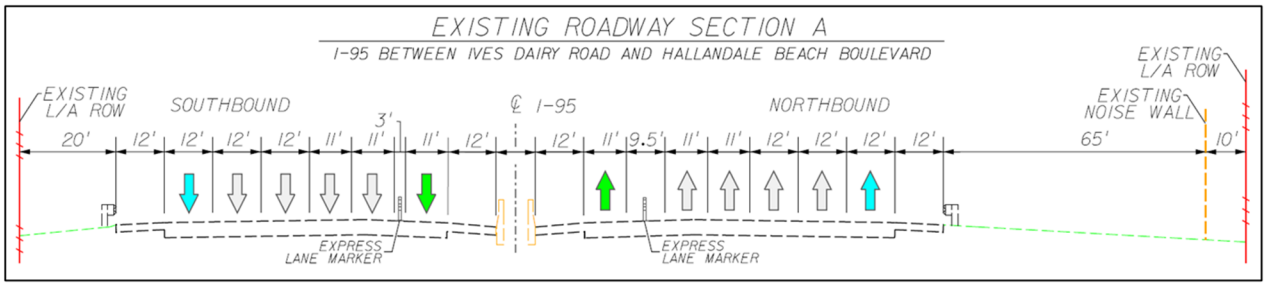


Figure 1.2 – I-95 Existing Roadway Section North of Hallandale Beach Boulevard.

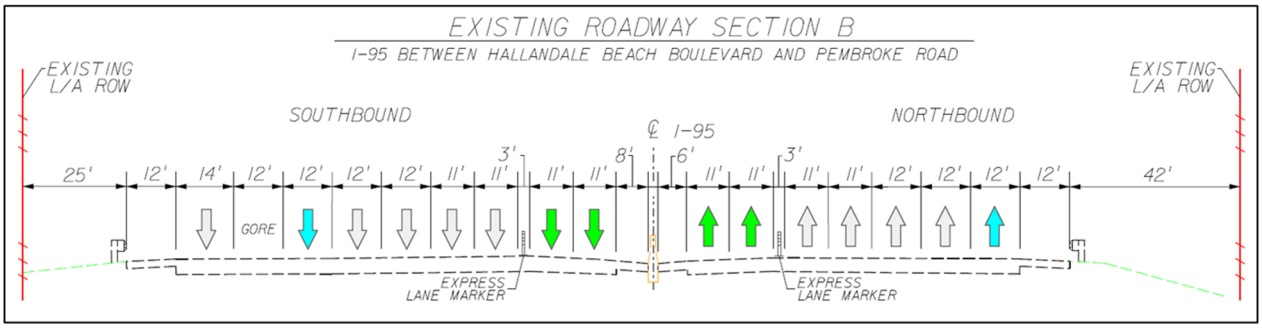


Figure 1.3 – I-95 Existing Roadway Section North of Pembroke Road

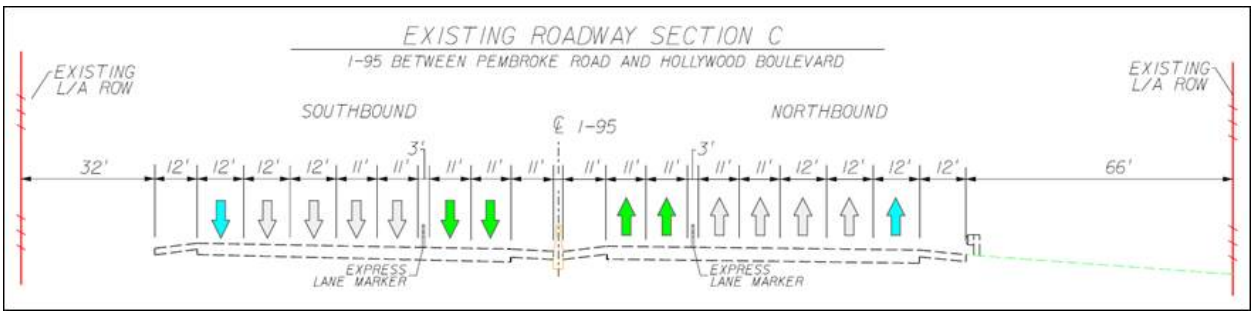


Figure 1.4 – I-95 Existing Roadway Section North of Hollywood Boulevard

There are five (5) existing bridge superstructures along the corridor and one (1) at Hollywood Boulevard west of I-95 that is over a canal. The first three (3) structures over I-95 from south to north, Bridge 860529 over Hallandale Beach Boulevard, Bridge 860531 over Pembroke Road, and Bridge 860530 over Hollywood Boulevard, are all four (4) spans using concrete AASHTO bridges and prestress Florida I-beams (FIBs) from the 2013 widening project. Bridge 860102 and 860202 are twin structures that carry northbound and southbound traffic of I-95 over Johnson Street; they are 3-span structures with AASHTO beams and were also previously widened. The existing bridge substructures of these five (5) bridges consist of typical end bents and multi-column intermediate piers. Bridges 860101 and 860102 share same substructure. Multi-column intermediate pier consists of several column-frame systems supporting bridge superstructures. Existing foundations are made of mostly deep foundations, precast prestress and/or drilled shafts.

The only bridge along the arterial roadways is Bridge 860599 on Hollywood Boulevard over the Hollywood Canal. The bridge consists of a simple span reinforced concrete slab and which was previously widened. The existing bridge substructure consists of end bents supported on precast prestressed concrete piles and precast concrete anchor beams. **Figure 1.5** illustrates the Existing Bridge Location Map along the project corridor. **Table 1.1** summarized the characteristics of the existing bridges.

SUMMARY OF STRUCTURES	
ITEM	QUANTITY
EXISTING BRIDGES TO REMAIN	6

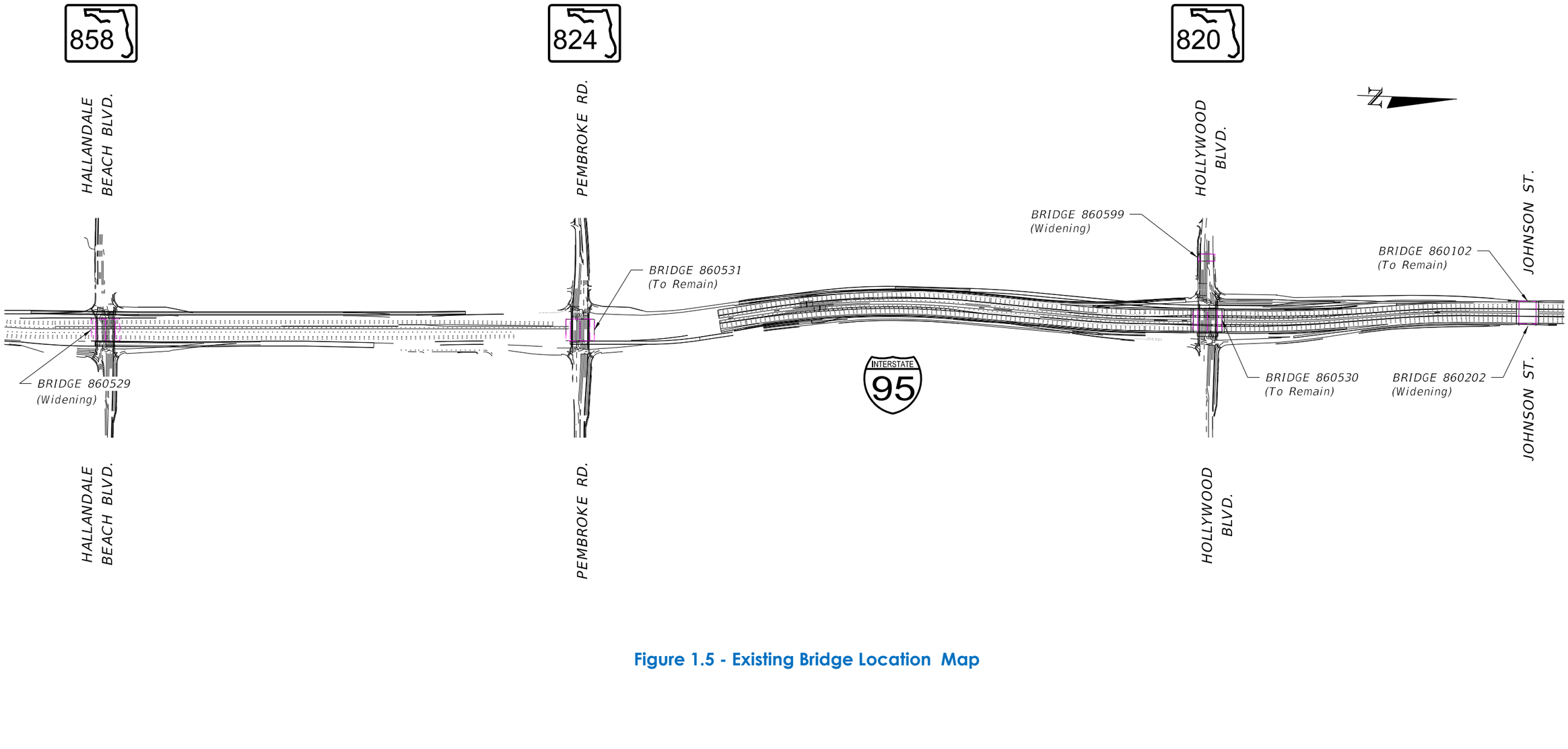


Figure 1.5 - Existing Bridge Location Map

Table 1.1 Existing Bridge Characteristics

LOCATION			GEOMETRICS					ALIGNMENT					STRUCTURAL					CONDITION					
Bridge ID No.	Bridge Location	Direction	Structure Length (ft)	Deck Width (ft)	Shoulder Width		No. of Lanes	Skew Angles (Degrees)	Horizontal Clearance		Min. Vertical Clearance (ft)	Underneath Roadway Designation	Number of Spans	Max. Span (ft)	Superstructure Type	Exterior Beam Type	Substructure Type	Year Built/ Widened	Sufficiency Rating (%)	Health Index	Load Rating	Inspection Date	Significant Deficiencies
					Inside	Outside			Inside (LF)	Outside (RT)													
860529	SR 9 / I-95 Over Hallandale Beach Boulevard (SR 858)	NB/SB	244	187.08	NB = 6'-8" SB = 8'-0"	NB = 13'-4" SB = 12'-0"	12 (6 in each direction)	0.00	13.00	14.67	16.50	SR 858 Hallandale Beach Blvd.	4	84	Prestressed Concrete Beams w/ CIP Concrete Deck	Prestressed FIB 45	Reinforced Concrete Column Piers and Abutments	Built in 1990, Widened in 2016	98.00	99.96	RF = 1.04, 37.4 Tons (Inv LRFR)	8/20/2015	None Visible
860531	SR 9 / I-95 Over Pembroke Road (SR 824)	NB/SB	243.5	187.08	NB = 6'-6" SB = 7'-9"	NB = 13'-6" SB = 12'-3"	12 (6 in each direction)	0.00	14.25	15.25	16.50	SR 824 Pembroke Road	4	84	Prestressed Concrete Beams w/ CIP Concrete Deck	Prestressed FIB 45	Reinforced Concrete Column Piers and Abutments	Built in 1990, Widened in 2016	98.00	99.89	RF = 1.00, 36.0 Tons (Inv LRFR)	8/20/2015	None Visible
860530	SR 9 / I-95 Over Hollywood Blvd.(SR 820)	NB/SB	244.00	187.08	NB = 6'-3" SB = 6'-3"	NB = 13'-9" SB = 13'-9"	12 (6 in each direction)	0.00	13.00	15.00	16.50	SR 820 Hollywood Blvd.	4	84	Prestressed Concrete Beams w/ CIP Concrete Deck	Prestressed FIB 45	Reinforced Concrete Column Piers and Abutments	Built in 1990, Widened in 2013	98.00	99.86	RF = 1.04, 37.4 Tons (Inv LRFR)	8/20/2015	None Visible
860599	SR 820 Over Hollywood Canal	EB/WB	20.25	Varies from 137.83 to 141.41	EB = 0'-0" WB = 0'-0"	EB = 1'-0" * WB = 1'-0"	EB = 6 lanes WB = 3 lanes	0.00	N/A	N/A	1.85 over DHW	Bridge Over Canal	1	20.25	CIP Concrete Deck Slab	N/A	Reinforced Conc. Abutments Supported on 18" sq Prest. Conc. Piles and Type II Anchor Beams	1971-1996	90.80	98.92	RF = 1.27 45.7 Tons (Inv LFR)	8/21/2015	None Visible
860102	I-95 OverJohnson St. SB	SB	147.00	97.67	10'-10 1/2"	10'-0"	6 Lanes	0.00	N/A	14.17	14.42	Johnson St.	3	71	Prestressed Concrete Beams w/ CIP Concrete Deck	AASHTO Type III	Reinforced Concrete Column Piers and Abutments (Bridges 860102 and 860101 share same substructure)	Built in 1962, Widened in 1990, 2nd widening 2020	89.70	99.95	RF = 1.28 46.1 Tons (Inv LRFR)	12/12/2017	Vertical Clearence
860202	I-95 OverJohnson St. NB	NB	147.00	97.67	10-10 1/2"	10'-0"	6 Lanes	0.00	N/A	15.47	15.47	Johnson St.	3	71	Prestressed Concrete Beams w/ CIP Concrete Deck	AASHTO Type III		Built in 1962, Widened in 1990, 2nd widening 2020	89.70	99.95	RF = 1.28 46.1 Tons (Inv LRFR)	12/12/2017	Vertical Clearence

1.3. Proposed Improvements

In recent years, extensive demographic and economic growth in Broward County has resulted in a significant increase in transportation demand along I-95 mainline and interchanges. In order to keep up with the steady growth along this highway facility and relieve current and future congestion, (FDOT) District Four has identified the need to provide adequate capacity to meet existing and future traffic needs by modification of existing entrance and exit ramps serving the three interchanges within the project limits.

This report evaluates the existing bridges along the corridor and discusses the proposed bridge improvements along the mainline and interchanges. Section 3 of this document discusses in detail the structures design alternatives in this project.

2. Design Criteria

2.1. General

This section includes the design data and criteria for the structure elements encompassing the existing and proposed structures required for the improvements of SR-9/I-95 from Hallandale Beach Boulevard to north of Hollywood Boulevard and Hollywood Boulevard west of SR-9/I-95.

A. Standards and Specifications

The following list of codes, standards, and specifications will be used during the design of the structures for this project:

- Florida Department of Transportation Standard Specifications for Road and Bridge Construction (2024 Edition).
- American Association of State Highway and Transportation Officials (AASHTO) "LRFD Bridge Design Specifications", 9th Edition, 2020.
- Florida Department of Transportation, Florida Design Manual (FDM), January 2024.
- Florida Department of Transportation Structures Manual, January 2024.
- Florida Department of Transportation FY 2024-25 Standard Plans.

B. Design Method(s)

- Load and Resistance Factor Design (LRFD)

C. Design Loadings

- Dead Loads:

Concrete (Bridge elements)	150 pcf
Steel, Structural:	490 pcf
Stay-in-Place Forms (SIP):	20 psf
Traffic Railing Barrier (Index 521-427):	430 plf
Concrete walls and deck	150 pcf

- Utilities (DW):
  No yet determined

- Future Wearing Surface (DW):
  Proposed bridges will have an 8½ in. slab thickness. For bridges to be widened the slab thickness will be 8 in.
  Design Loading: None (proposed bridges)
  15 psf (for widenings)

- Live Load (LL+IM):
  Design Loading: HL-93
  Permit Loading: FL-120

- Wind Loads (WL, WS): Per AASHTO LRFD 3.8 and SDG 2.4.

- Creep, Shrinkage and Thermal Effects (CR, SH, TU):
  The design mean temperature shall be 70° F.

  Thermal effects due to temperature rise and fall shall be calculated for the following temperature ranges:

  For concrete structures: Temperature Rise and/or Fall: 35° F
  For concrete deck on steel girder: Temperature Rise and/or Fall: 40° F

  Coefficient of thermal expansion:
  Concrete structure: 6.0x10-6 per °F
  Steel Structure: 6.5x10-6 per °F
  Shrinkage: Per AASHTO LRFD 5.4.2.3

- Vehicular Collision Force: All columns shall be designed in accordance with the SDG Section 2.6 and AASHTO LRFD Section 3.6.5. Pier protection can be implemented by:

  a) Pier-column designed to support 600 kips and shielding the columns using Pier Shielding Barriers (Index 521-001) or Guardrails (Index 536-001), if adequate offset is provided.

  b) Using Pier Protection Barriers (PPB, Index 521-002) where this barrier can absorb the load regardless of the pier resistance.

Prestressed concrete piles located within mechanically stabilized earth walls are considered protected and are not subject to the vehicular collision force.

D. Material Properties

The existing bridges date from 1990 to 1996 with widening done in 2013. Specific material properties of these structures are shown in existing plans. For the proposed structures, the materials listed below shall be used in the design of the structure elements presented in this Bridge Analysis Report:

Concrete

Concrete shall be specified in accordance with the FDOT Standard Specifications for Road and Bridge Construction, 2024 Edition, and the FDOT SDG Section 1.4.3. The following concrete properties are specified:

Class	Minimum 28-day Compressive Strength (psi)	Location
II	$f`_c$ = 3,400	Traffic Railing Barriers
II (Bridge Deck)	$f`_c$ = 4,500	Bridge Deck and Approach Slabs
IV	$f`_c$ = 5,500	CIP Substructure
V (Special)	$f`_c$ = 6,000	Concrete Piling
VI	$f`_c$ = 8,500	Prestressed Girders

Reinforcing Steel

Reinforcement shall be ASTM A615, Grade 60 ksi.

Structural Steel

All structural steel shall be in accordance with ASTM A709, Grade 50 ksi, unless otherwise noted. Stiffeners, internal and external cross frames, lateral bracing and other ancillary items may be Grade 50 ksi unless otherwise noted.

Prestressing Steel

Prestressed strands shall conform to ASTM A416, Grade 270, low relaxation strands.

E. Concrete Cover

Unless otherwise noted, the following concrete covers shall be used:

Superstructure:	
All Exterior and Interior surfaces	2"
Substructure:	
External surfaces cast against earth and surfaces in contact with water	4"
External formed surfaces	3"
Prestressed Piling	3"
Top and side of Pedestals	2"
Front face of wall, top of barriers & parapet	2"

2.2. Environmental Classification

The classification of the bridge environment was provided by GCME, Inc. in the report "Geotechnical Services Report – Preliminary PD&E Study – SR-9/I-95", dated December 21, 2018. Based on the test results and the FDOT SDG Section 1.3 the site has been classified as follows:

Substructure: Slightly Aggressive.

Superstructure: Slightly Aggressive

2.3. Aesthetics

This section summarizes the preliminary structures aesthetics criteria for bridges and walls along the project corridor. These recommendations are based on the FDM 121.9.3. The project corridor is about three miles in length and the bridge aesthetics divided in two groups, widening and proposed structures.

- Bridge Widenings along Corridor: Level 1 Aesthetics, proposed superstructure elements to match those existing, same girder type.
- Proposed Bridges: Level 1 Aesthetics. Concrete superstructures shall have the same facia girder. For Steel Structures, the use of uncoated weathering steel superstructures may be considered if site conditions, as determined by the State Materials Office, satisfy the criteria per SDG 1.3.2.E.2 and 5.12.1, since the corridor is just 3 miles from the intracoastal waterway.

3. Alternative Analysis

3.1. Bridge Alternatives

The objective of this BAR is to evaluate structure alternatives that will address existing and proposed improvements along the project corridor. In order to keep up with the growing traffic demand within the study area, two build alternatives have been considered in this PD&E Study. These alternatives were developed with the goal of reducing congestion and delay while also maximizing the efficiency of the transportation system.

3.1.1. Alternative 1:

Alternative 1 proposes braided ramps between interchanges to improve substandard weaving movements along I-95. In this alternative, the on-ramps from each interchange will remain unchanged. However, the off-ramps to Pembroke Road and Hollywood Boulevard in the northbound direction and to Pembroke Road and Hallandale Beach Boulevard in the southbound direction will be located one interchange prior to the destination interchange. **Figure 3.1** shows the roadway section north of Hallandale Beach Boulevard and **Figure 3.2** shows the roadway section north of Pembroke Road.

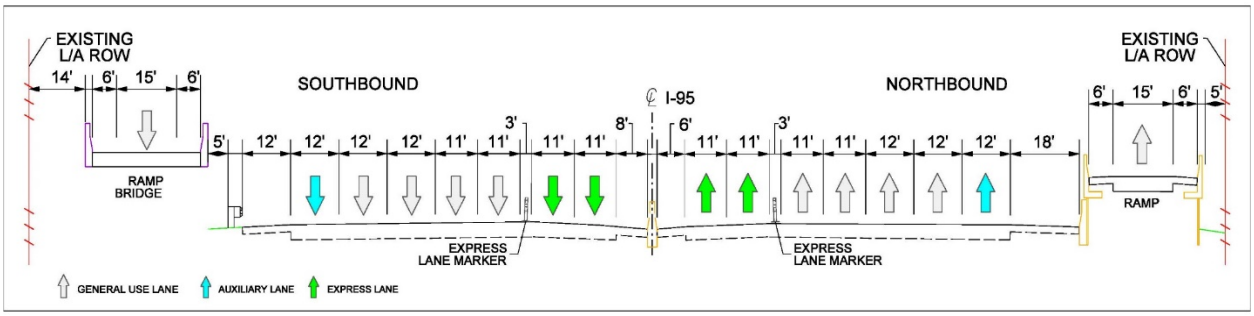


Figure 3.1 – Alternative 1 Roadway Section North of Hallandale Beach Boulevard

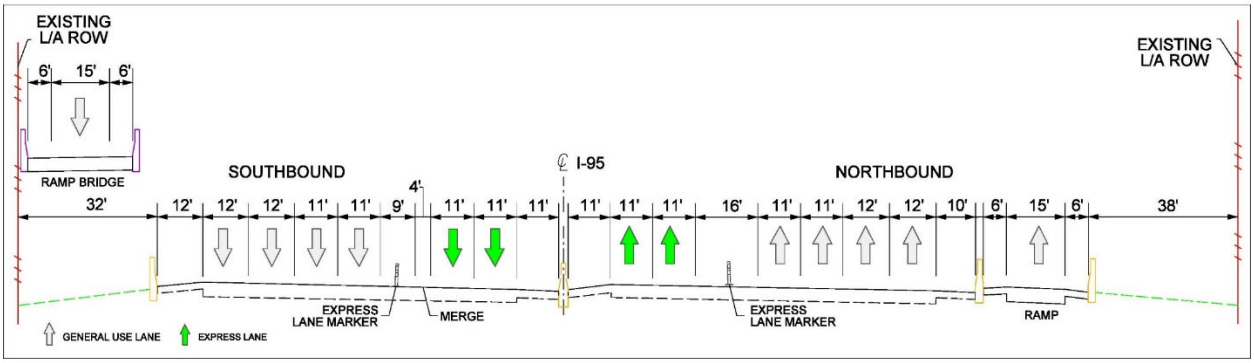


Figure 3.2 – Alternative 1 Roadway Section North of Pembroke Road

Alternative 1 includes four proposed new bridges (two concrete and two steel), two proposed bridge widenings and six existing bridges to remain. The proposed improvements of each bridge structure along the corridor are summarized in **Figure 3.3** and **Table 3.1**.

SUMMARY OF STRUCTURES	
ITEM	QUANTITY
PROPOSED NEW BRIDGES STEEL	2
PROPOSED NEW BRIDGES CONCRETE	2
PROPOSED BRIDGE WIDENINGS	2
EXISTING BRIDGES TO REMAIN	6

* CATEGORY 2 STRUCTURES

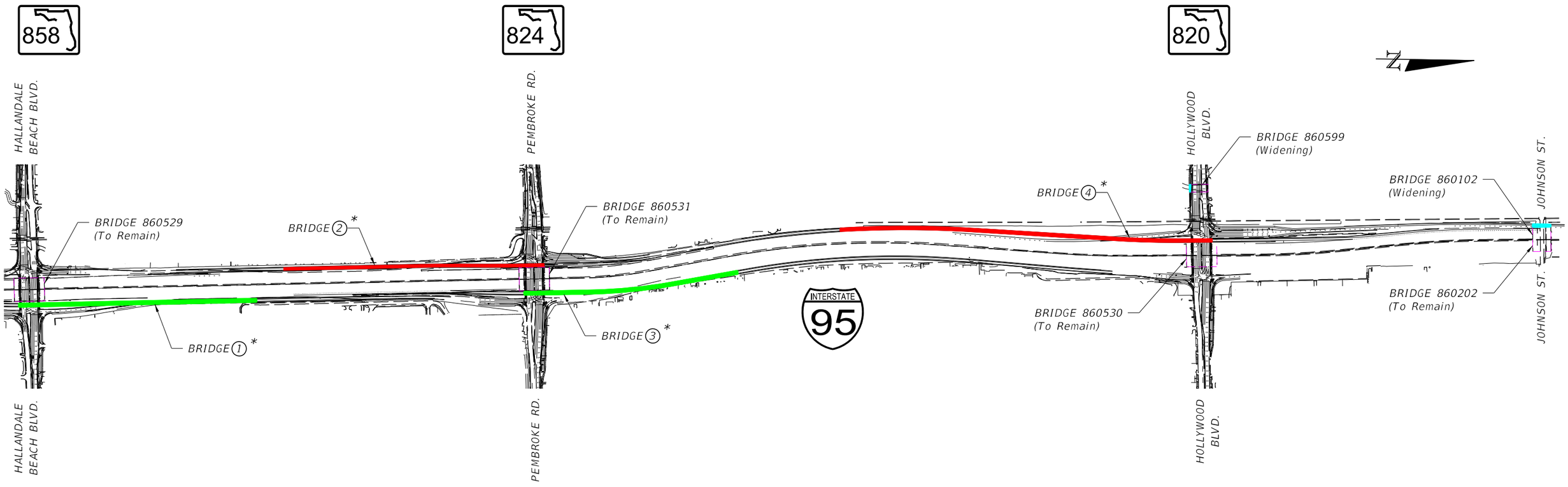


Figure 3.3 Bridge Location Map -Alternative 1

Table 3.1
Proposed Bridge Characteristics Alternative 1

LOCATION			GEOMETRICS					STRUCTURAL					
Bridge ID No.	Bridge Location	Direction	Overall Bridge Length / Span Arrangement (ft)	Deck Width (ft)	Min. Vertical Clearance	Skew Angles (Degrees)	Underneath Roadway Designation	Number of Spans	Max. Span	Superstructure Type	Substructure Type	Approach / Bridge Type	Bridge Category
1	SR 9 / I-95 NB off-ramp to Pembroke Rd.(SR824)	NB	170+(9x180)+126= 1916	29.67	16.50	0.00	SR 858 Hallandale Beach Blvd. and SR 9/ I-95 NB on-ramp from SR 858 Hallandale Beach Blvd.	11	180	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	2
2	SR 9 / I-95 SB off-ramp to Hallandale Beach Boulevard (SR 858)	SB	126+(3x180)+200+170+(5x180)+166= 2102	29.67	16.50	0.00	SR 824 Pembroke Road and SR 9/ I-95 SB on-ramp from SR 824 Pembroke Road	12	200	Steel	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	2
3	SR 9 / I-95 NB off-ramp to Hollywood Blvd. (SR820)	NB	167+(8x180)+126= 1733	29.67	16.50	0.00	SR 824 Pembroke Road and SR 9/ I-95 NB on-ramp from SR 824 Pembroke Road	10	180	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	2
4	SR 9 / I-95 SB off-ramp to Pembroke Rd. (SR824)	SB	126+(15x180)+174= 3000	29.67	16.50	0.00	SR 820 Hollywood Blvd.and SR 9 / I-95 SB on-ramp from SR 820 Hollywood Blvd	17	180	Steel	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	2
860599	SR 820 Over Hollywood Canal	EB/WB	61.00	Varies from 10.73 to 11.92	1.85 over DHW	0.00	N/A Over Canal	1	61	CIP Concrete Deck Slab	Reinforced Conc. Abutments Supported on 18" sq Prest. Conc. Piles	Widening FIBs	1
860102	SR 9 / I-95 Over Johnson Street	SB	38+71+38= 147	Varies from 21.96 to 36.59	14.42	0.00	Johnson St.	3	71	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Widening FIBs	1

3.1.2. Alternative 2

Alternative 2 proposes a collector distributor roadway system within the I-95 mainline project area. The collector distributor roadway system will remove the Pembroke Road Interchange from interacting with the I-95 mainline. In the northbound direction, all exiting traffic to Pembroke Road and Hollywood Boulevard will utilize a new collector distributor off-ramp just south of Hallandale Beach Boulevard. The collector distributor roadway system will extend to just north of Hollywood Boulevard serving the exit traffic to Pembroke Road, entry traffic from Pembroke Road and entry traffic from Hollywood Boulevard. In the southbound direction, the new collector distributor roadway system will not be continuous, it will end and begin at Pembroke Road. The first section combines the off-ramps to Hollywood Boulevard and Pembroke Road and the second section moves the Pembroke Road on-ramp to enter I-95 south of the Hallandale Beach Boulevard on-ramp. **Figure 3.4** shows the roadway section north of Hallandale Beach Boulevard and **Figure 3.5** shows the roadway section north of Pembroke Road.

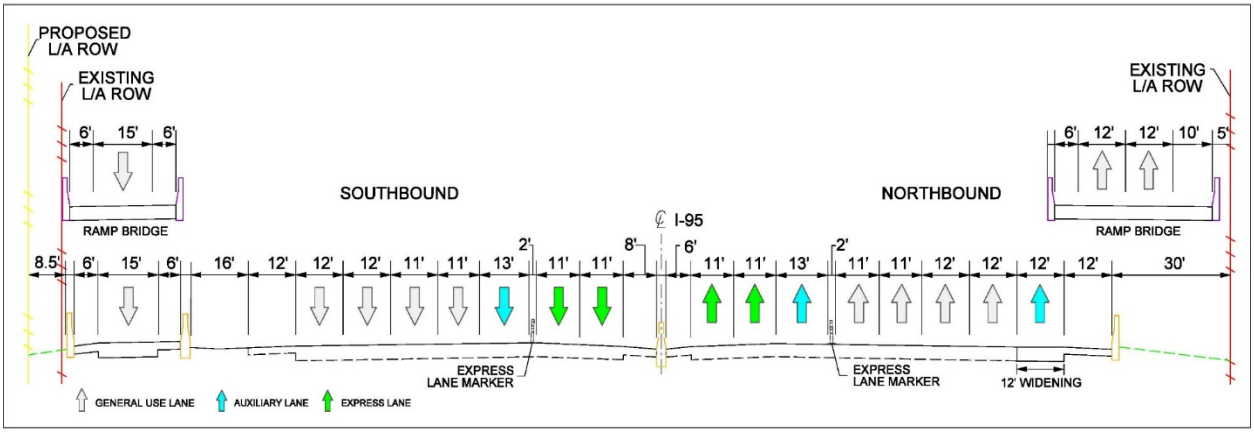


Figure 3.4 – Alternative 2 Roadway Section North of Hallandale Beach Boulevard.

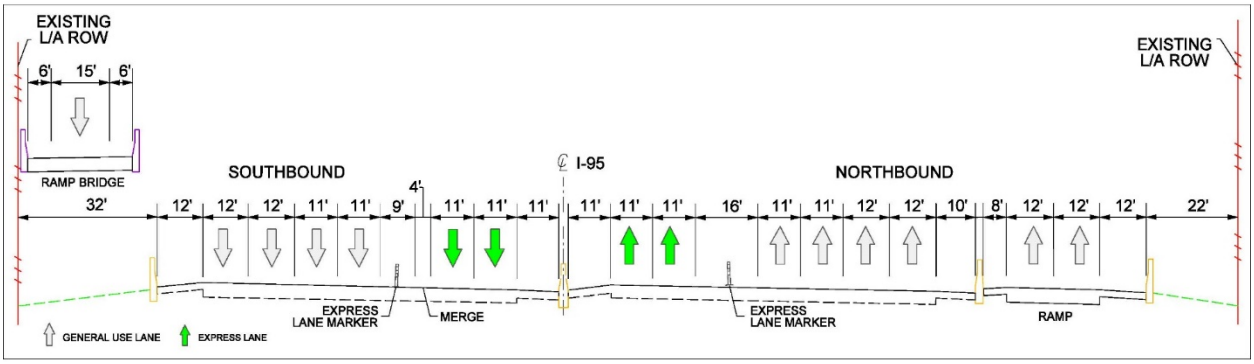


Figure 3.5 – Alternative 2 Roadway Section North of Pembroke

The alternative includes five proposed new bridges (four concrete and one steel), two proposed bridge widenings and six existing bridges to remain. The proposed improvements of each bridge structure along the corridor are summarized in **Figure 3.6** and **Table 3.2**.

The widenings and one of the new structures are Category 1 bridges whereas five of the new structures are Category 2.

SUMMARY OF STRUCTURES	
ITEM	QUANTITY
PROPOSED NEW BRIDGES STEEL	1
PROPOSED NEW BRIDGES CONCRETE	4
PROPOSED BRIDGE WIDENINGS	2
EXISTING BRIDGES TO REMAIN	6

* CATEGORY 2 STRUCTURES

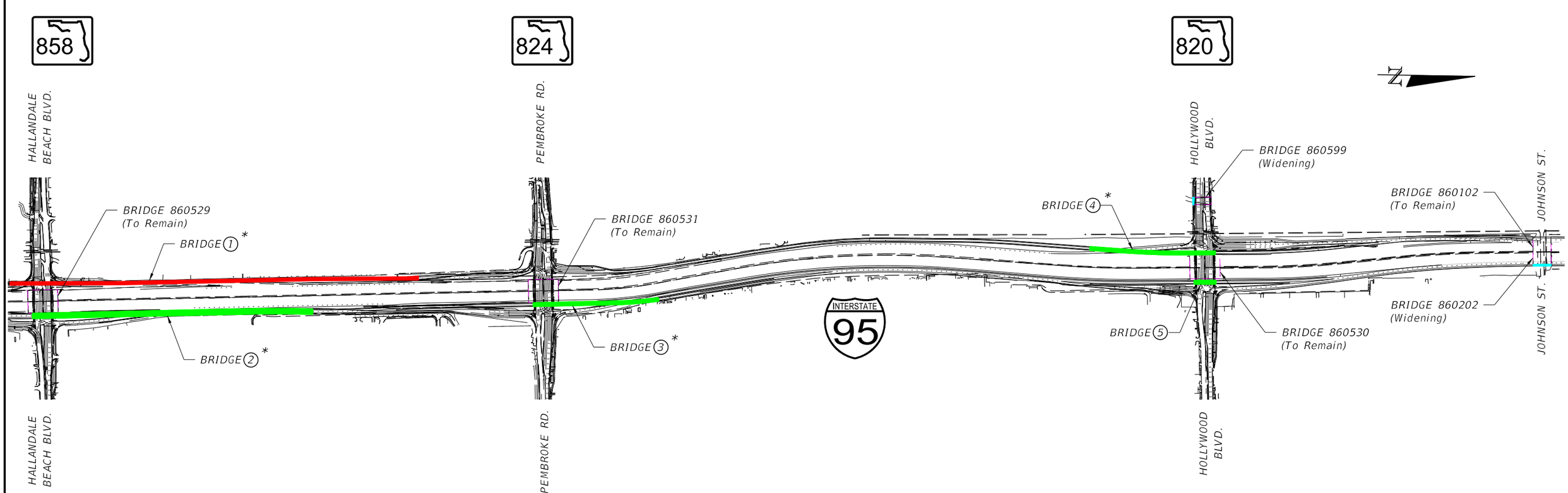


Figure 3.6 Bridge Location Map -Alternative 2

Table 3.2
Proposed Bridge Characteristics Alternative 2

LOCATION			GEOMETRICS					STRUCTURAL					
Bridge ID No.	Bridge Location	Direction	Overall Bridge Length / Span Arrangement (ft)	Deck Width (ft)	Min. Vertical Clearance	Skew Angles (Degrees)	Underneath Roadway Designation	Number of Spans	Max. Span	Superstructure Type	Substructure Type	Approach / Bridge Type	Bridge Category
1	SR 9 / I-95 SB on-ramp over Hallandale Beach Blvd. (SR858	SB	(15x180)+(2x140)+200+140= 3320	Varies from 29.667 to 34.13	16.50	0.00	SR 858 Hallandale Beach Blvd., SR 9/ I-95 SB off-ramp to SR 858 Hallandale Beach Blvd. and I-95 on ramp from Hallandale Beach Blvd.	19	200	Steel	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	2
2	SR 9 / I-95 NB off-ramp to Pembroke Rd.(SR824)	NB	171+(11x180)+126= 2277	42.67	16.50	0.00	SR 858 Hallandale Beach Blvd.	13	180	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	2
3	SR 9 / I-95 NB Ramp Over Pembroke Road (SR 824)	NB	170+(4x180)+130= 1020	29.67	16.50	0.00	SR 824 Pembroke Road	6	180	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	3
4	SR 9 / I-95 SB off-ramp to Pembroke Rd. (SR824)	SB	126+(180x4)+174= 1020	29.67	16.50	1.00	SR 820 Hollywood Blvd.and SR 9 / I-95 SB on-ramp from SR 820 Hollywood Blvd	6	180	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Curved Steel, Single Lane	2
5	SR 9 / I-95NB Ramp over Hollywood Blvd.(SR 820)	SB	177	29.67	16.50	0.00	SR 820 Hollywood Blvd.	1	177	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	New Bridge, Prestress Concrete, FIBs	1
860599	SR 820 Over Hollywood Canal	EB/WB	61.00	Varies from 10.73 to 11.92	1.85 over DHW	0.00	N/A Over Canal	1	61	CIP Concrete Deck Slab	Reinforced Conc. Abutments Supported on 18" sq Prest. Conc. Piles	Widening FIBs	1
860202	SR 9 / I-95 Over Johnson Street	NB	38+71+38= 147	17.62	13.14	0.00	Johnson St.	3	71	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Widening FIBs	1

3.1.3. Preferred Alternative

The preferred alternative for the I-95 corridor is based on the Alternative 2 alignment analysis and the evaluation results summarized as part of the PD&E Study. The preferred alternative includes six proposed new bridges (five concrete and one steel), one proposed bridge widening and five existing bridges to remain. The proposed improvements of each bridge structure along the corridor are summarized in **Figure 3.7** and **Table 3.3.**

SUMMARY OF STRUCTURES	
ITEM	QUANTITY
PROPOSED NEW BRIDGES STEEL	1
PROPOSED NEW BRIDGES CONCRETE	5
PROPOSED BRIDGE WIDENINGS	1
EXISTING BRIDGES TO REMAIN	5

*CATEGORY 2 STRUCTURES

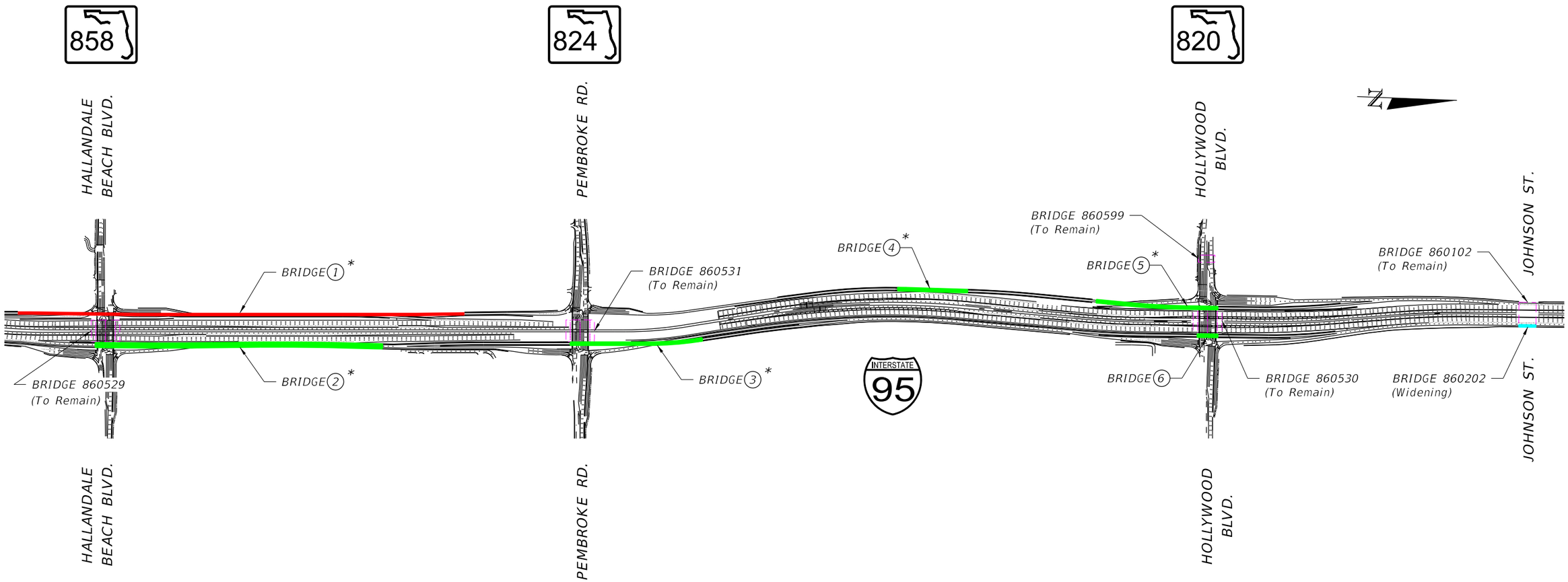


Figure 3.7 Bridge Location Map -Preferred Alternative

Table 3.3
Proposed Bridge Characteristics Preferred Alternative

LOCATION			GEOMETRICS					STRUCTURAL					
Bridge ID No.	Bridge Location	Direction	Structure Length (ft)	Deck Width (ft)	Min. Vertical Clearance	Skew Angles (Degrees)	Underneath Roadway Designation	Number of Spans	Max. Span	Superstructure Type	Substructure Type	Approach / Bridge Type	Bridge Category
1	SR 9 / I-95 SB on-ramp over Hallandale Beach Blvd. (SR858	SB	126+(4x180)+(3x170)+(2x130)+(5x180)+(2x125)+(4x170)+220+160= 3826	29.67	16.50	0.00	SR 858 Hallandale Beach Blvd., SR 9/ I-95 SB off-ramp to SR 858 Hallandale Beach Blvd. and I-95 on ramp from Hallandale Beach Blvd.	22	220	Steel	Reinforced Concrete Column Piers C-Piers, Straddle Piers	New Steel Bridge , Single Lane	2
2	SR 9 / I-95 NB off-ramp to Pembroke Rd.(SR824)	NB	171+(4x146.75)+130+153+(10x142)= 2461	42.67	16.50	0.00	SR 858 Hallandale Beach Blvd. and I-95 on ramp from Hallandale Beach Blvd.	14	180	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers C-Piers, Straddle Piers	New Bridge, Prestress Concrete, FIBs	2
3	SR 9 / I-95 NB Ramp Over Pembroke Road (SR 824)	NB	168+(139x3)+(150x3)+100= 1135	29.67	16.50	0.00	SR 824 Pembroke Road	8	150	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers C-Piers, Straddle Piers	New Bridge, Prestress Concrete, FIBs	2
4	SR 9 / I-95 SB off-ramp to Pembroke Rd. (SR824)	SB	4x150 = 600	29.67	16.50	0.00	SR 9 / I-95 SB	4	150	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers C-Piers, Straddle Piers	New Bridge, Prestress Concrete, FIBs	2
5	SR 9 / I-95 SB off-ramp to Pembroke Rd. (SR824)	SB	6x174= 1044	29.67	16.50	0.00	SR 820 Hollywood Blvd.and SR 9 / I-95 SB on-ramp from SR 820 Hollywood Blvd	6	182	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers C-Piers, Straddle Piers	New Bridge, Prestress Concrete, FIBs	2
6	SR 9 / I-95NB Ramp over Hollywood Blvd.(SR 820)	SB	177	29.67	16.50	0.00	SR 820 Hollywood Blvd.	1	177	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	New Bridge, Prestress Concrete, FIBs	1
860202	SR 9 / I-95 Over Johnson Street NB	NB	38+71+38= 147	13.14	15.47	0.00	Johnson St.	3	71	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Widening FIBs	1

3.1.4. Preferred Alternative Refinements

Subsequent coordination with the local municipalities after the first public hearing generated several requests to modify the preferred alternative in specific areas to meet their local needs. Therefore, FDOT addressed these requests and evaluated several modifications to the preferred alternative. Between 2023 and 2024, FDOT completed the evaluation and finalized the refinements to the preferred alternative.

The preferred alternative refinements include six proposed new bridges (two concrete, two steel and a combination of steel and concrete spans), two proposed bridge widenings, one pile supported slab structure and six existing bridges to remain. **Figure 3.8** and **Table 3.4** summarize the proposed bridge improvements.

Section 4 discusses in detail each of the structures being improved and those proposed.

SUMMARY OF STRUCTURES	
ITEM	QUANTITY
PROPOSED NEW BRIDGES STEEL	2
PROPOSED NEW BRIDGES CONCRETE	2
PROPOSED NEW BRIDGE STEEL/CONCRETE	1
PROPOSED NEW BRIDGE PILE SUPPORTED SLAB	1
PROPOSED BRIDGE WIDENINGS	2
EXISTING BRIDGES TO REMAIN	6

*CATEGORY 2 STRUCTURES

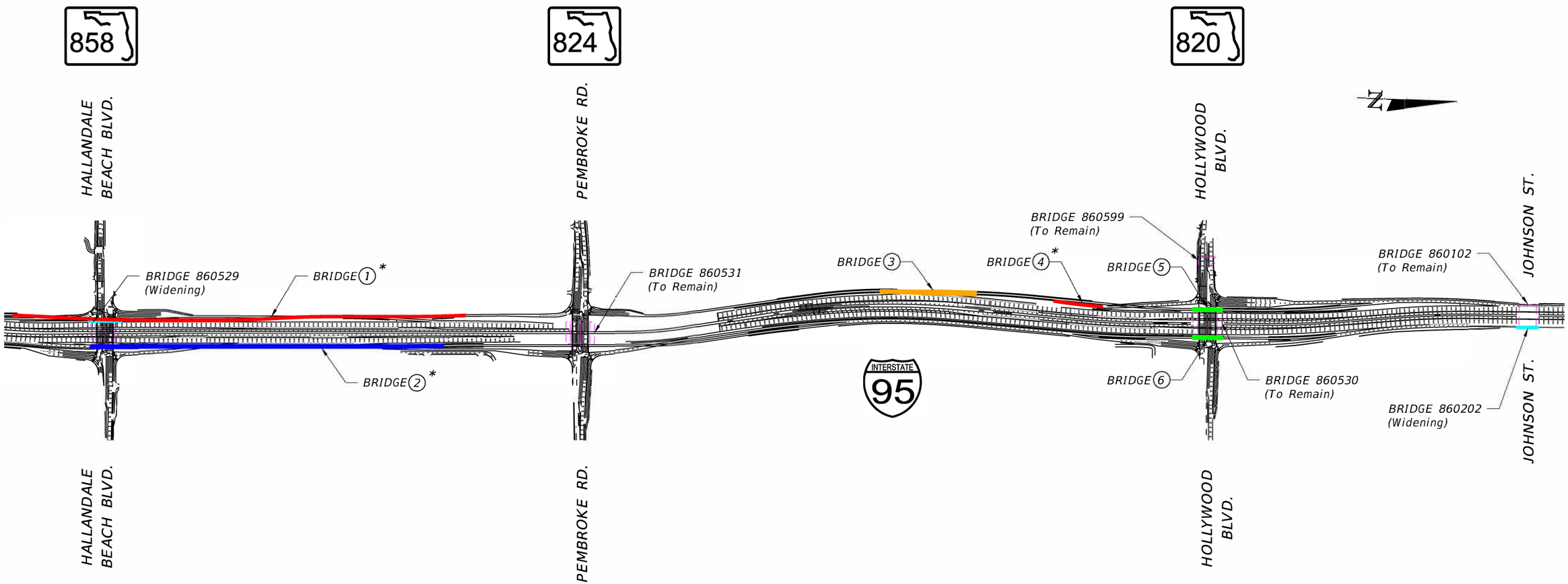


Figure 3.8 Bridge Location Map -Refined Preferred Alternative

Table 3.4
Proposed Bridge Characteristics Refined Preferred Alternative

LOCATION			GEOMETRICS					STRUCTURAL					
Bridge ID No.	Bridge Location	Direction	Structure Length (ft)	Deck Width (ft)	Min. Vertical Clearance	Skew Angles (Degrees)	Underneath Roadway Designation	Number of Spans	Max. Span	Superstructure Type	Substructure Type	Approach / Bridge Type	Bridge Category
1	SB Ramp from Pembroke Road to I-95 over Hallandale Beach Blvd.	SB	159+197+159+163+195+170+(176x2)+177+163+204+163+163+204+163+163+204+163+144+157+214+145 = 3822	29.67	16.50	0.00	Hallandale Beach Blvd., I-95 SB off-ramp to Hallandale Beach Blvd., I-95 on ramp from Hallandale Beach Blvd. and pump station	22	214	Steel	Reinforced Concrete Column Hammerfead, offset hammerhead, C-Piers, Straddle Piers	New Steel Bridge	2
2	NB Ramp from NB I-95 to Pembroke Road over Hallandale Beach Blvd.	NB	185+170+174+170+228+317+212+(152x7)+125+125+97+97 = 2964	29.67	16.50	0.00	Hallandale Beach Blvd. and I-95 on ramp from Hallandale Beach Blvd.	18	317	Prestressed Concrete Beams w/ CIP Concrete Deck and Steel	Reinforced Concrete Column Hammerhead, Straddle Piers	New Bridge, Combine Prestress Concrete, FIBs and Steel	2
3	SB Ramp from Hollywood Blvd to Pembroke Road	SB	125+(101x7) = 832	Varies from 29.67 to 38.67	16.50	0.00	Overhang SB I-95	N/A	18' cantilever	Pile Supported Slab	Slab with integral Pile Bents	Slab with integral Pile Bents	1
4	SB Ramp from I-95 SB to Pembroke Road over SB On-Ramp from Hollywood Blvd	SB	155+183 = 338	29.67	16.50	0.00	I-95 SB on-ramp from Hollywood Beach Blvd.	2	187	Steel	Straddle Pier	New Steel Bridge	2
5	SB Ramp from I-95 SB to Pembroke Road over SB On-Ramp from Hollywood Blvd	SB	194	29.67	16.50	0.00	Hollywood Blvd.	1	194	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Abutments	New Bridge, Prestress Concrete, FIBs	1
6	NB CD from Pembroke Road I-95 NB over Hollywood Blvd	NB	194	29.67	16.50	0.00	Hollywood Blvd.	1	194	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Abutments	New Bridge, Prestress Concrete, FIBs	1
860202	NB I-95 over Johnson Street	NB	38+71+38= 147	18.96	14.50	0.00	Johnson St.	3	71	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Widening FIBs	1
860202	SB I-95 over Hallandale Beach Blvd	SB	38+84+84+38= 244	12.27	16.50	0.00	Hallandale Beach Blvd.	4	84	Prestressed Concrete Beams w/ CIP Concrete Deck	Reinforced Concrete Column Piers and Abutments	Widening FIBs	1

4. Structures Analysis

There are thirteen (13) structures within the project limits; five (5) new bridges, two (2) bridge widening, one (1) pile supported slab structure, and five (5) existing bridges. A detailed description of each of the proposed structures is presented below and Section 6 of this document includes the Bridge Concept Plans.

4.1. Bridge 1 – Southbound Ramp from Pembroke Road to I-95 over Hallandale Beach Boulevard.

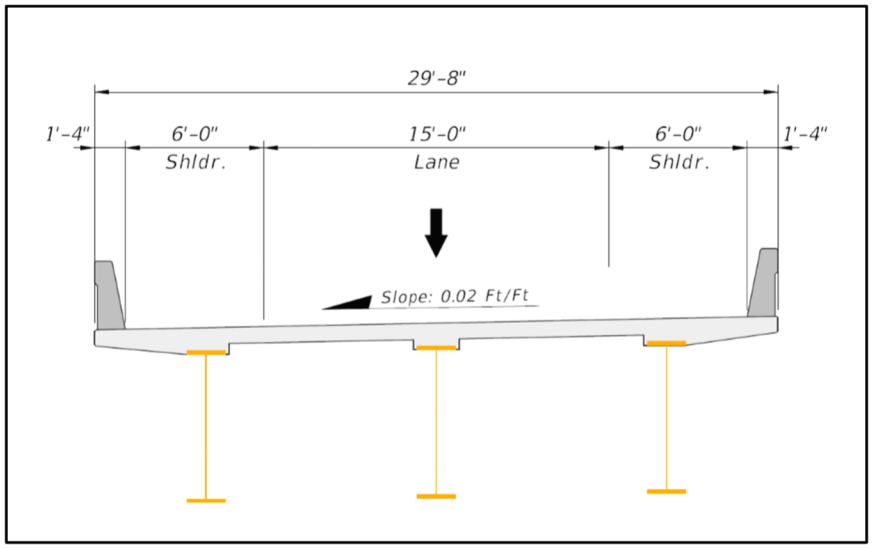


Figure 4.1 - Proposed Bridge 1 Typical Section

The proposed viaduct is a 3,822 ft long one-lane structure located west and approximately parallel to I-95. The bridge carries the ramp from Pembroke Road over an existing pump station, the off-ramp to Hallandale Beach Boulevard, Hallandale Beach Boulevard, and the on-ramp from Hallandale Beach Boulevard. The proposed single lane bridge ramp would accommodate one (1) 15 ft lane with 6 ft inside and outside shoulders and standard 1.33 ft wide traffic railing barriers on each side for an overall bridge width 29.67 ft. (See **Figure 4.1)**

The structure has twenty-two (22) spans divided into six continuous bridge units and 4 single spans; the bridge unit length is selected based on the movement of a strip seal expansion joint.

The span arrangement is as follows:

Unit 1 = 159' + 197' + 159' = 515'
Unit 2 = 163'+195' + 170' = 528'
Unit 3 (Simple Span) = 176'
Unit 4 (Simple Span) = 176'
Unit 5 (Simple Span) = 177'
Unit 6 = 163' + 204' + 163' = 530'
Unit 7 = 163' + 204' + 163' = 530'
Unit 8 = 163' + 204' + 163' = 530'
Unit 9 (Simple Span) = 144'
Unit 10 = 170' + 214' + 145' = 59'

The begin bridge location is determined by the clearance needed for the MSE walls of a retained abutment to clear the shoulder of the southbound I-95 on-ramp from Hallandale Beach Boulevard. The end bridge location is set to allow the MSE walls for a retained abutment to clear the existing pump station located just south of Pembroke Road. This results in an overall minimum bridge length of 3815 feet. The span arrangement is controlled by the span length required to span over Hallandale Beach Boulevard, the southbound I-95 off-ramp, and the existing pump station.

At the Hallandale Beach Boulevard crossing, hammerhead piers are used to minimize the span length to approximately 194 feet. A span length of approximately 214 feet is required to span over the existing pump station. This span is beyond the limits for a prestress concrete prestress concrete Florida I-Beam (FIB); hence, the use of FIBs is not feasible for this bridge. Given these span lengths, a steel plate girder bridge type was selected, and a three-span arrangement was used to maximize economy. The adjacent spans are set at 70% to 80% of the main span length for a balanced arrangement. Once these two controlling units were set, the balance of the bridge was set by maximizing the use of three-span plate girder units with similar superstructure depths and balanced span arrangements. To accommodate the future widening of this structure, several simple spans will be required in the tapered section of the ramp. This is necessary to provide for the future framing plan for the varying width of the future bridge.

This resulted in six continuous three span steel plate girder units and four simple span steel plate girder units as described above. For steel plate girders the

assumed superstructure depth will be selected based upon AASHTO LRFD Section 2.5.2.6.3 recommendations for superstructure depth. Therefore, the total superstructure depth of 98 inches and will be maintained for the full length of the structure. A three-girder arrangement is assumed for maximum economy.

Vertical clearance is controlled by the crossing of southbound on-ramp from Hallandale Beach Boulevard, Hallandale Beach Boulevard, the southbound I-95 outside shoulder, the southbound off-ramp from Hallandale Beach Boulevard which weaves beneath the bridge, and the required clearance over the existing pump station. The required vertical clearance is 16.5 feet and is measured to the bottom of the girder, bottom of pier caps or bottom of the straddle bent as required.

Limited information was available for the existing pump station including utilities. For the purposes of this BAR the bridge profile was set to clear the approximately 16 ft tall building and the piers were set to provide a minimum horizontal clearance of approximately 15 feet for maintenance considerations. Further coordination is required to determine specific clearances and should include such considerations as maintenance access, future pump station equipment replacement, and utilities servicing the pump station. This coordination must take place during the Bridge Development Report (BDR) phase.

In order to maintain the required clearances, the substructure piers will consist of hammerhead, offset hammerhead, C-piers and sit on straddle piers. **Figure 4.2** depicts the typical hammerhead pier applicable to six piers and the typical offset column hammerhead pier applicable to five pier locations. **Figure 4.3** shows the C-piers used at seven locations. Pier 16 requires a knee pier with inverted-T cap. **Figure 4.4** shows the sit-on straddle pier applicable to Piers 4 and 17. Section 6 of this report shows the Concept Plans for this long structure.

Since the columns for the proposed bridges will be designed to sustain vehicle collision, pier protection barriers are not needed, but rather the 44" tall pier shielding barriers are used.

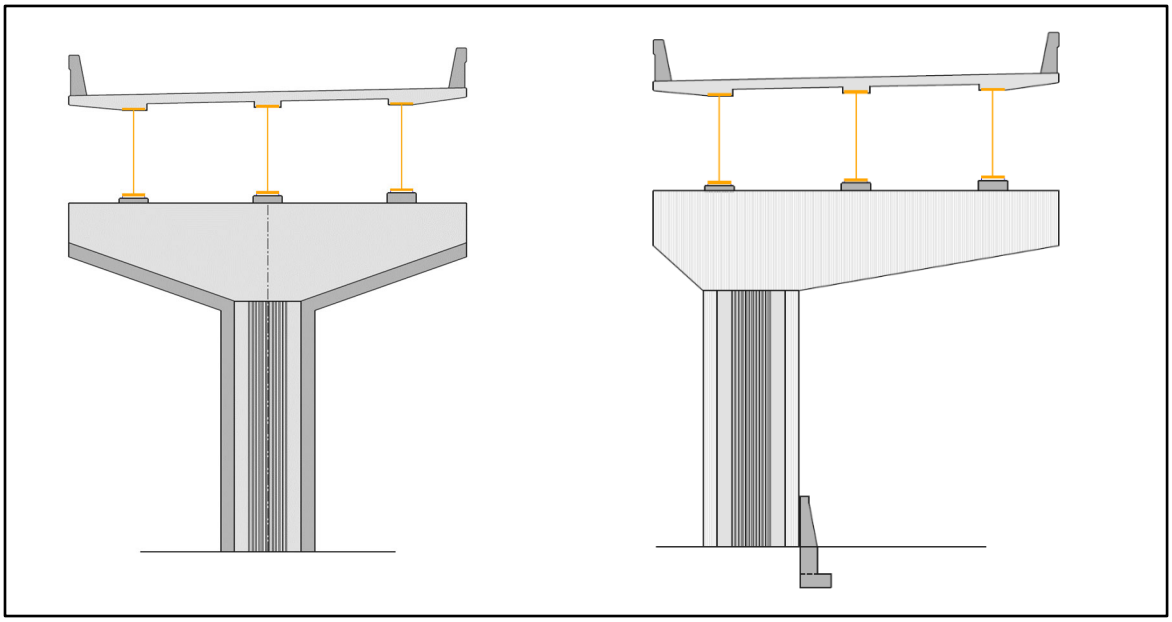


Figure 4.2 Hammerhead Pier

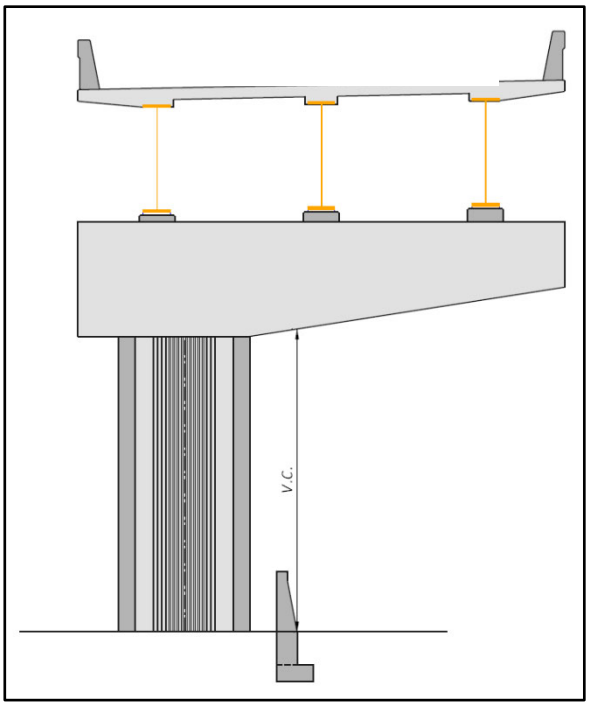


Figure 4.3 Typical C-Pier

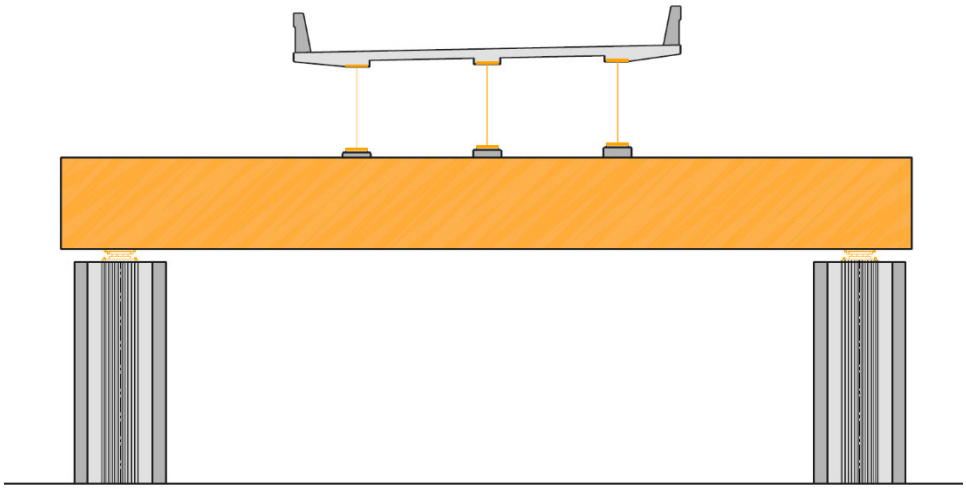


Figure 4.4 Typical Straddle-Pier – Piers 4 and 17

The future connection from the managed lanes greatly impacts the design of the proposed viaduct (Bridge 1). After Bridge 1 is constructed parallel to southbound I-95, the proposed future connection will be difficult to construct. To accommodate this future connection, portions of the substructure must be constructed in this phase of the project which greatly complicates the substructure design for this bridge.

The future widening of this structure to accommodate the merging braided ramp will be to the east side of the bridge and the future girders will be located over the southbound lanes of I-95. Substructure units required to support these future girders cannot be accommodated without impacting southbound mainline traffic lanes. Therefore, the only practical solution is to overbuild the proposed pier caps to accommodate the future girder lines as part of this phase of the project. Pier caps can be extended as shown in the typical C-Piers details in **Figure 4.5.** This will require that during the BDR and final design of this phase of the project a design of the proposed build as well as a preliminary design for future widening will be required to ensure the adequacy of the piers to support the future loads. The additional load of the future widening must also be considered in the foundation design of these piers which will increase the size of the footings toward the I-95 mainline and beneath the existing MSE wall (see **Figure 4.6**). Southbound mainline closures may be required for this construction or a westward shift in the alignment of the ramp should be considered to provide additional space. This will be coordinated during the Bridge Development Report phase.

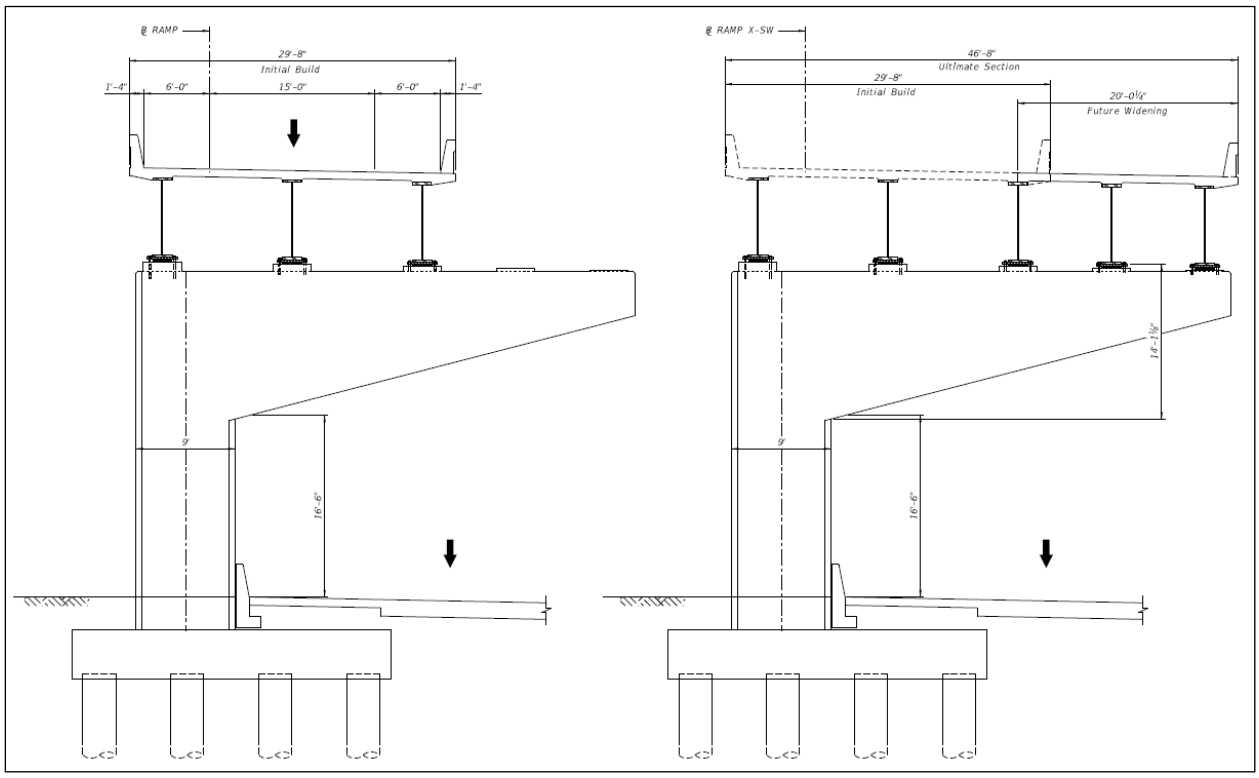


Figure 4.5 Substructure Overbuild for Future Widening

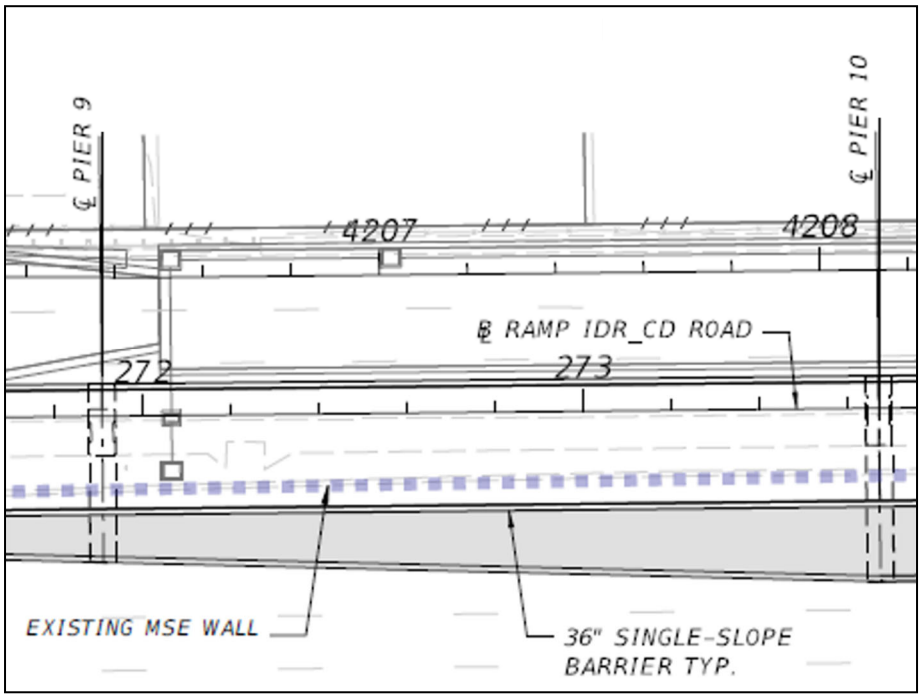


Figure 4.6 Foundation Constrains

Pier 19 represents an extreme case of a substructure unit that must be designed and constructed considering the future connection during this phase. This pier is located at the gore area between Bridge 1 and the future braided ramp structure from the southbound managed lanes. **Figure 4.7** depicts both the initial build condition and ultimate configuration of this pier. As shown in this figure, the pier extension needed to accommodate the future managed lane braided ramp bridge is quite large.

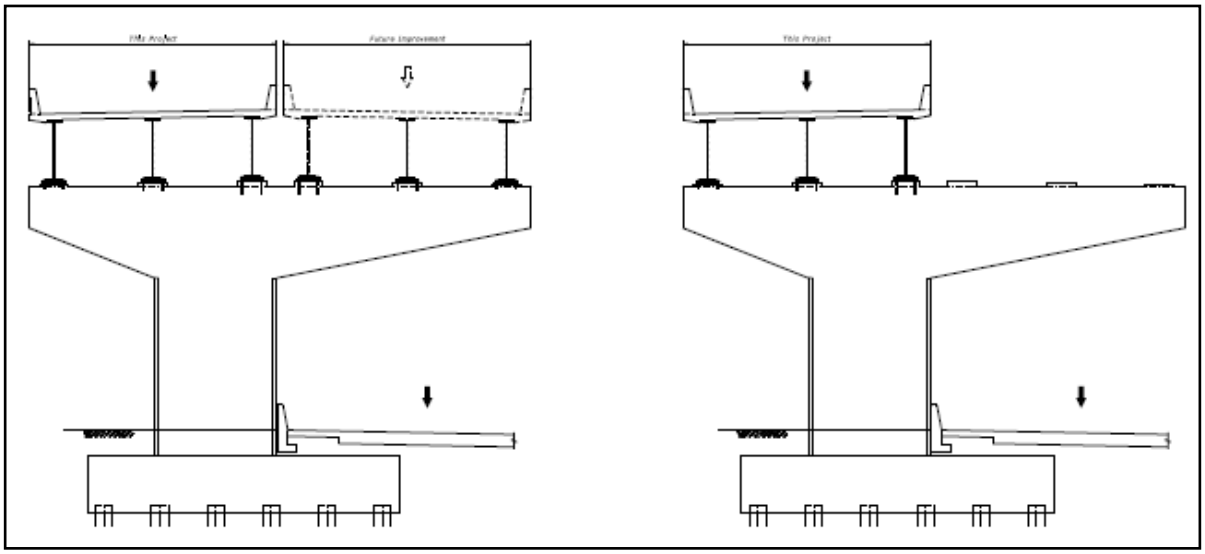


Figure 4.7 Pier 19 Substructure Overbuild for Future Widening

One potential solution would be to design the foundation and column for the future ultimate condition but only size the pier cap to accommodate bridge 1 for the initial build. The pier cap and its reinforcing can be detailed so that in the future, a partial demolition of the pier cap would expose the reinforcing so that bars for the cap extension could be lapped to the existing reinforcing. This would allow for the cap to be extended to its full width to accommodate the girders for the future bridge. **Figure 4.8** depicts this approach which would be investigated further during the Bridge Development Report phase.

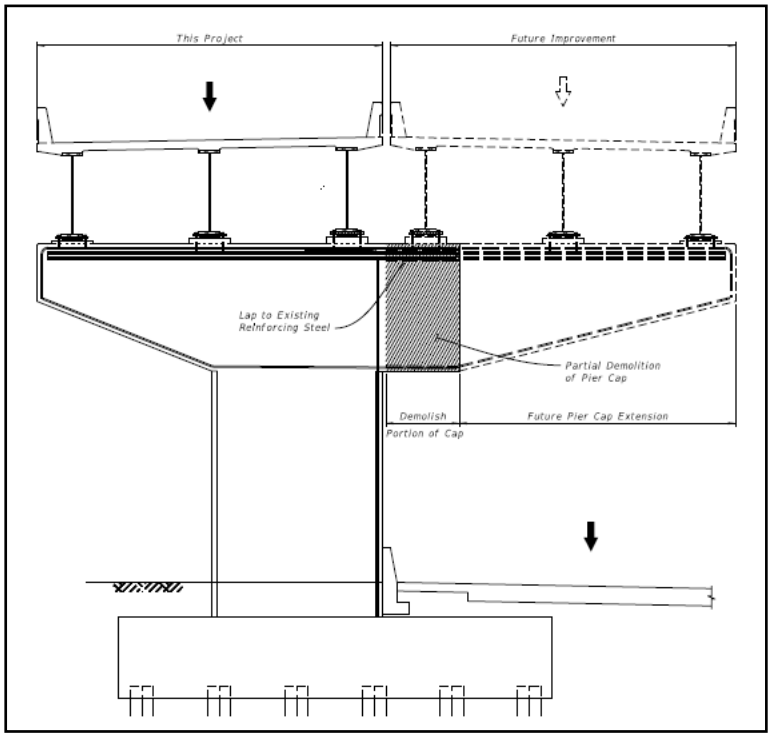


Figure 4.8 Pier 19 Substructure Overbuild for Future Widening

4.2. Bridge 2 – Northbound Ramp from Northbound I-95 to Pembroke Road over Hallandale Beach Boulevard. and Northbound On-Ramp from Hallandale Beach Boulevard.

The proposed viaduct is a 2,964 ft long one-lane structure located east and parallel to the southbound of I-95 and carries traffic over Hallandale Beach Boulevard and the I-95 northbound on-ramp from Hallandale Beach Boulevard which continues beneath the bridge to Pembroke Road. The proposed structure also carries traffic over two proposed drainage ponds. The purpose of the bridge is to provide a ramp connecting northbound I-95 to Pembroke Road utilizing a grade separation over Hallandale Beach Boulevard.

The proposed bridge would accommodate one (1) 15 ft lane with 6 ft inside shoulder and 10 ft outside shoulder and standard 1.33 ft wide traffic railing barriers on each side for an overall bridge width 29.67 ft. The superstructure will consist of a mix of FIB girders and Steel plate girders with an 8½" concrete deck. The minimum vertical clearance over Hallandale Beach Boulevard and the I-95 northbound on-ramp from Hallandale Beach Boulevard is 16.5 ft.

The structure has eighteen (18) spans divided into eight continuous bridge units. The lengths of the continuous units are expected to be within the range of thermal

movements that can be accommodated by a strip seal expansion joint. The span arrangement is as follows:

Unit 1 (FIB 96 Girders) = 185' + 170' = 355'
Unit 2 (FIB 96 Girders) = 174' + 170' = 344'
Unit 3 (Steel Plate Girders) = 228' + 317' + 212' = 757'
Unit 4 (FIB 78 Girders) = 152' + 152' = 304'
Unit 5 (FIB 78 Girders) = 152' + 152' = 304'
Unit 6 (FIB 78 Girders) = 152' + 152' = 304'
Unit 7 (FIB 78 Girders) = 152' + 125' = 277'
Unit 8 (FIB 54 Girders) = 125' + 97' + 97' = 319'

The begin bridge location is determined by setting the MSE walls for a retained abutment outside the clear zone of the eastbound Hallandale Beach Boulevard outside shoulder. The end bridge location is determined by setting the MSE walls for a retained abutment to clear the proposed pond located along the east side of northbound I-95 just south of Pembroke Road. This results in an overall bridge length of 2964 linear feet. The span arrangement is controlled by the span length required to span over the northbound I-95 on-ramp from Hallandale Beach Boulevard which weaves beneath the proposed structure at a significant skew. A straddle bent and an offset column hammerhead pier are used to minimize the span length resulting in a controlling span length of 317 feet. This large span length requires steel plate girders, and a three span arrangement was used to maximize economy. The adjacent spans are set at 65% to 75% of the main span length for a balanced arrangement. Once this controlling unit was set, the balance of the bridge was set by switching to an FIB girder superstructure to reduce the overall cost of the bridge.

For the three span continuous steel plate girder unit, the assumed superstructure depth will be selected based upon AASHTO LRFD Section 2.5.2.6.3 recommendations for superstructure depth. This resulted in a total superstructure depth of 138 inches and will be maintained for the full length of the continuous unit. The total superstructure depth for the FIB units will vary from approximately 96 to 57 inches to reduce the vertical profile where possible. A three-girder arrangement is assumed for maximum economy. Cheek walls will be added to the piers where required to conceal changes to superstructure type and depth.

The substructure piers consist of standard hammerhead piers, integral straddle piers, offset hammerhead, inverted-T hammerhead piers, and offset inverted-T hammerhead. **Figure 4.9** depicts the integral straddle bent applicable to pier 6. **Figure 4.10** shows the offset hammerhead pier applicable to pier 7. **Figure 4.11** shows the inverted-T hammerhead piers applicable to five piers. **Figure 4.12** shows the offset inverted-T hammerhead piers applicable to three piers where the column needs to be offset from the center of the pier cap to maintain horizontal clearances. The other seven piers are standard hammerhead. Section 6 of the report shows the Concept Plans for this long structure.

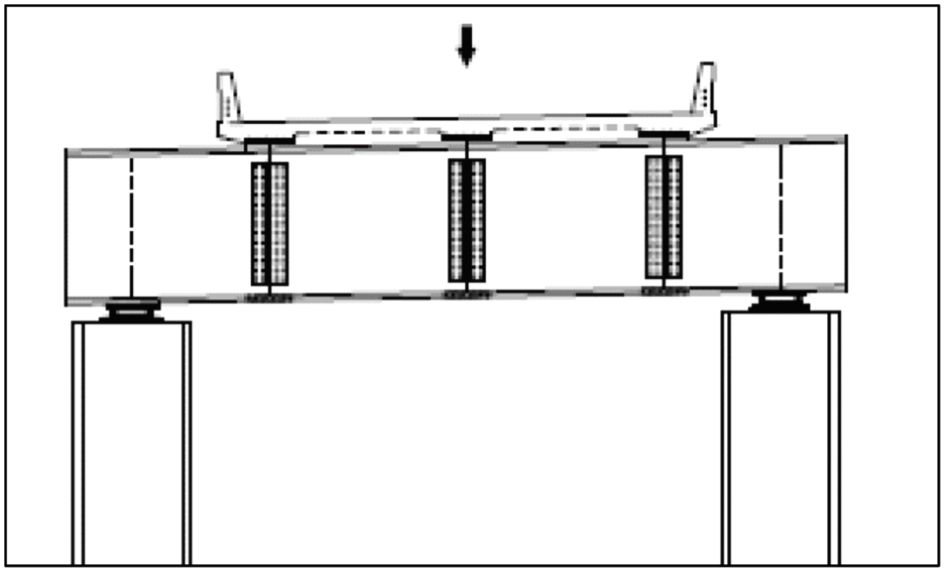


Figure 4.9 Typical Straddle Bent – Piers 6

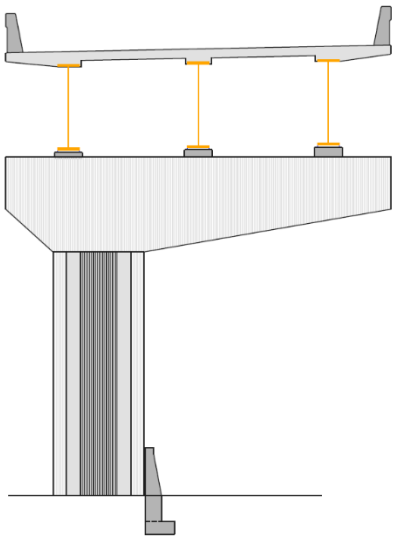


Figure 4.10 Typical Offset Hammerhead Pier – Piers 10

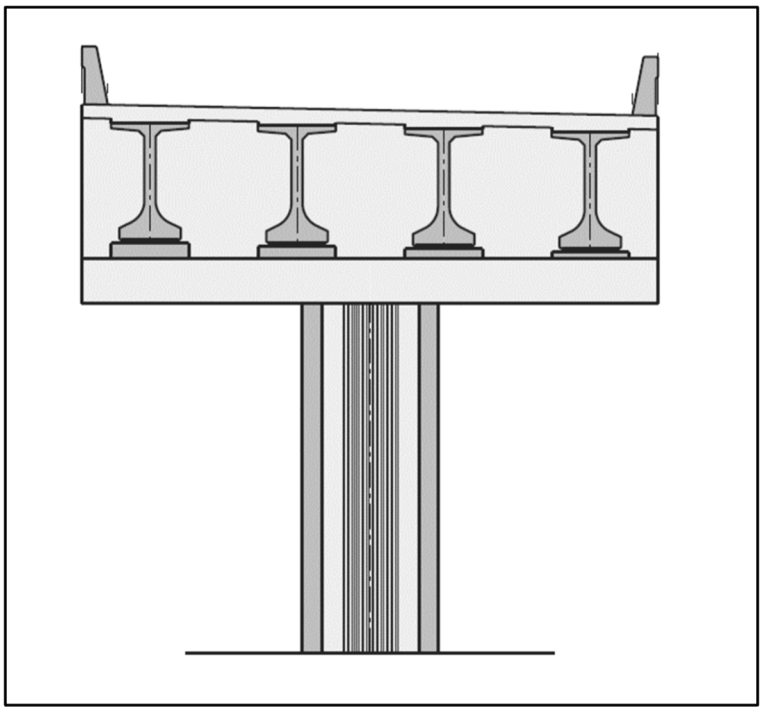


Figure 4.11 Typical Hammerhead Pier with Inverted-T Cap

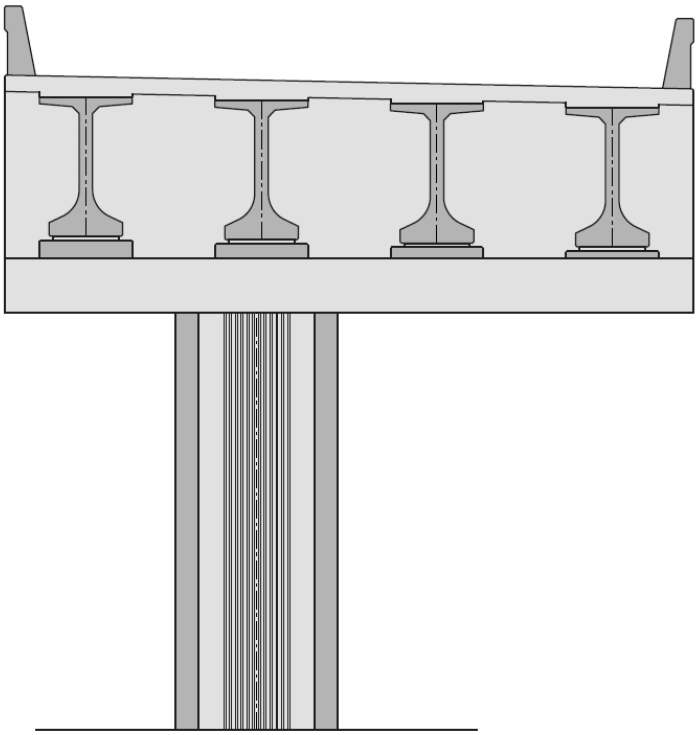


Figure 4.12 Typical Offset Hammerhead Pier with Inverted-T Cap

An additional substructure constraint worth noting is provided by the on-ramp from Halladale Beach Boulevard to Pembroke Road. The two lane on-ramp splits beneath the proposed integral straddle pier with one lane merging with northbound I-95 and the other lane continuing parallel to I-95 to Pembroke Road. An existing noise wall along the east right-of-way constricts the space for the lane providing connection to Pembroke Road requiring a proposed shoulder width exception. The bridge piers must be placed within the limited space between this lane and I-95 which will limit the allowable column size and thus span length.

Vertical clearance is controlled by the need to span over the I-95 northbound on-ramp from Hallandale Beach Boulevard. A vertical clearance of 16.5 feet needs to be provided to the bottom of the straddle bent cap and the bottom of the hammerhead pier cap located on each side of the on-ramp.

4.3. Bridge 3 – Southbound Ramp from Hollywood Boulevard. to Pembroke Road (Pile Supported Slab)

The proposed pile supported slab is an 832 foot long, variable width structure located west of I-95 and supports a portion of the ramp which overhangs I-95 southbound. The purpose of the structure is to allow the construction of a ramp connecting Hollywood Boulevard to Pembroke Road within the limited space between I-95 southbound and the CSX Railroad right-of-way. An innovative pile supported slab is recommended here due to the limited space for pier foundation construction adjacent to the CSX RR right-of-way. Furthermore, the reduced superstructure depth allows for a lower vertical profile.

The proposed bridge ramp transitions from one (1) 15 ft lane with 6 ft inside and outside shoulders and standard 1.33 ft wide traffic railing barriers on each side for an overall bridge width 29.67 ft to two (2) 12 ft lanes with 6 ft inside and outside shoulders for an overall bridge width 38.67 ft. See **Figure 4.13** for a typical section.

The structure has eight (8) units; one 125 ft unit and seven 101 ft units. The slab depth varies from 9 inches to 15 inches deep. The slab overhang varies from 6.27 ft to 18.02 ft when measured from the centerline of the inside pile. The one-way slab is supported on integral pile supported beams measuring 3 feet wide and 2 feet deep constructed longitudinal to the ramp. The beams will be supported using 18 inch precast prestressed concrete piles. Section 6 of the report shows the Concept Plans for this structure.

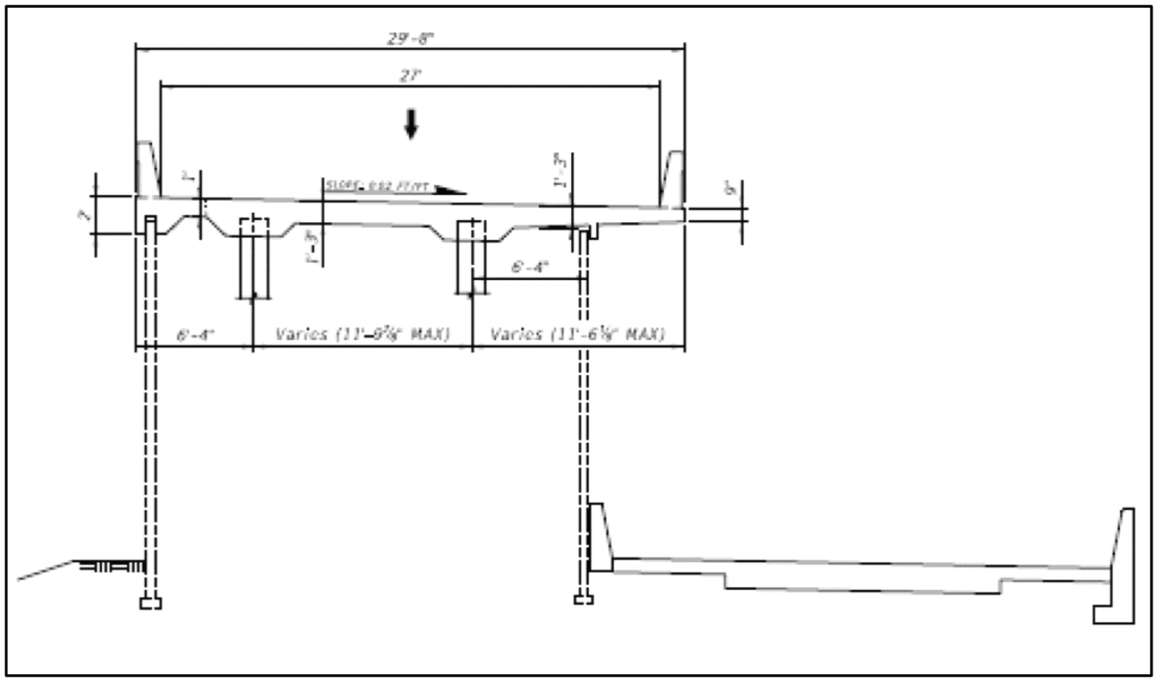


Figure 4.13 Pile Supported Slab Section

4.4. Bridge 4 – Southbound Ramp from I-95 Southbound to Pembroke Road over the Southbound On-Ramp from Hollywood Boulevard.

The proposed Bridge 4 is a two span bridge carrying the southbound ramp from I-95 southbound to Pembroke Road over the southbound on-ramp from Hollywood Boulevard which weaves beneath the bridge at a significant skew. The begin and end bridge locations are determined by locating the MSE walls for retained abutments to clear the shoulders located along both sides of the southbound I-95 on-ramp from Hollywood Boulevard. This results in an overall bridge length of 338 linear feet. The proposed single lane bridge ramp accommodates one (1) 15 ft lane with 6 ft inside and outside shoulders and standard 1.33 ft wide traffic railing barriers on each side for an overall bridge width 29.67. The structure will utilize two (2) spans with an integral steel straddle bent pier spanning over the on-ramp. Placing the columns for the straddle bent within the available gore areas results in a two-span bridge with span lengths of 155 feet and 183 feet. See **Figure 4.14** for details of the integral straddle bent.

Because of these span lengths and the integral bent cap, a steel plate girder bridge type was selected, and a two span arrangement was used. This resulted in a total superstructure depth of 88 inches and will be maintained for the full length of the continuous unit. A three-girder arrangement is assumed for maximum economy. The minimum vertical clearance over the southbound on-ramp is 16.5 feet. Since the columns for the proposed bridges will be designed to sustain vehicle collision, pier protection barriers are not needed, but rather the 44" tall pier shielding barriers are used. Section 6 of the report shows the Concept Plans for this structure.

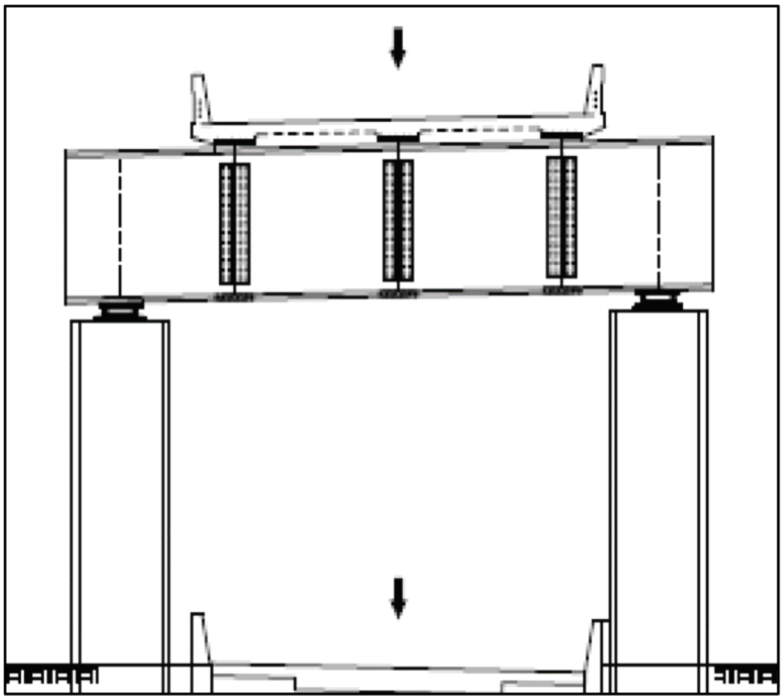


Figure 4.14 Integral Straddle Bent Pier

4.5. Bridge 5 – Southbound Ramp from I-95 Southbound to Pembroke Road over Hollywood Boulevard.

The proposed Bridge 5 is a single span bridge carrying the southbound ramp from I-95 southbound to Pembroke Road over Hollywood Boulevard. The proposed bridge is parallel and directly adjacent to the existing four span I-95 bridge over Hollywood Boulevard (860530). Although the existing bridge is four spans, a single span bridge is proposed here to readily accommodate the surface street turning movements to and from the I-95 ramps. The total length of the bridge is 194 feet long. The proposed bridge would accommodate one (1) 15 ft lane with 6 ft inside and outside shoulders and standard 1.33 ft wide traffic railing barriers on each

side for an overall bridge width 29.67 ft. (See **Figure 4.15**) The superstructure will consist of FIB 96 concrete girders with an 8½" concrete deck supported on composite neoprene bearing pads. The minimum vertical clearance over Hollywood Boulevard is 16.5 feet. The substructure consists of reinforced concrete end bents supported on precast prestressed concrete piles. Section 6 of the report shows the Concept Plans for this structure.

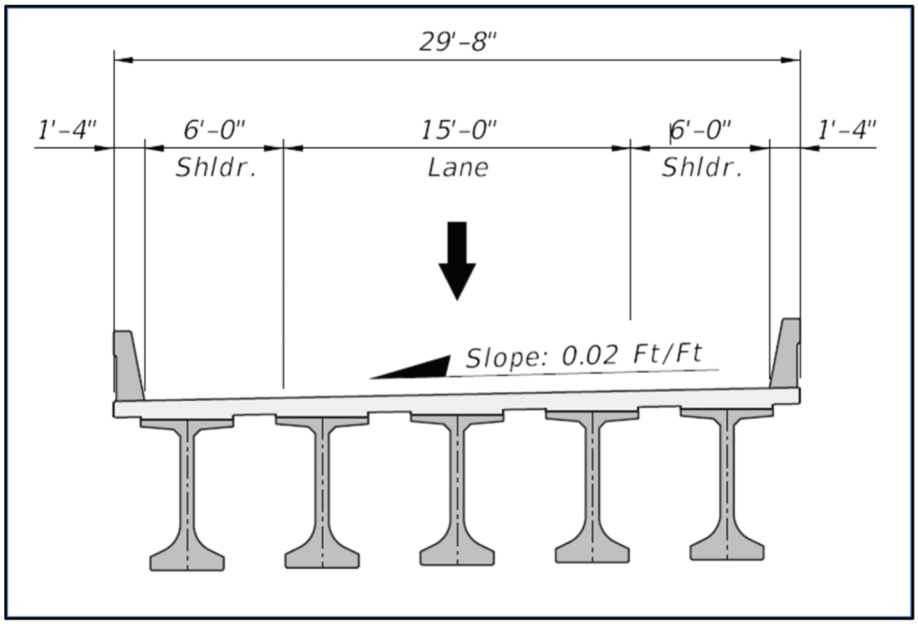


Figure 4.15 - Proposed Bridge 5 Typical Section

4.6. Bridge 6 – Northbound Ramp from I-95 Northbound to Pembroke Road over Hollywood Boulevard.

The proposed Bridge 6 is a single-span bridge over Hollywood Boulevard, carrying the traffic of the northbound ramp from I-95 northbound to Pembroke Road over Hollywood Boulevard. The proposed bridge is parallel and directly adjacent to the existing four span I-95 bridge over Hollywood Boulevard (860530). Although the existing bridge is four spans, a single span bridge is proposed here to readily accommodate the surface street turning movements to and from the I-95 ramps. The total length of the bridge is 194 feet long. The proposed bridge would accommodate one (1) 15 ft lane with 6 ft inside and outside shoulders, for a total bridge width of 29.67 ft. The bridge uses standard 1.33 ft single slope wide traffic railing barriers. (See **Figure 4.16**)

The superstructure will consist of FIB-96 concrete girders with 8½" concrete deck supported on composite neoprene bearing pads. The minimum vertical clearance over Hollywood Boulevard. is 16.5 ft. The substructure consists of reinforced concrete end bents supported on precast prestressed concrete piles. MSE walls will be in front of the end bents. Section 6 of the report shows the Concept Plans for this structure.

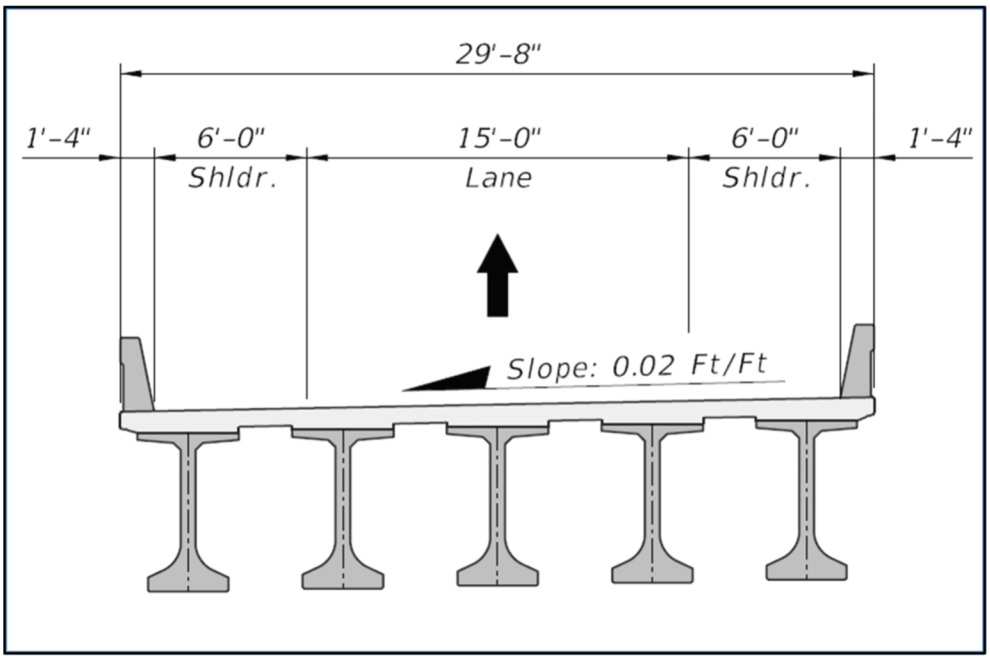


Figure 4.16 - Proposed Bridge 6 Typical

4.7. Bridge 860202 - SR 9 / I-95 Over Johnson Street

Existing Condition

Bridge 860202 carries I-95 northbound traffic over Johnson Street The bridge is a twin structure of Bridge 860102 which carries the I-95 southbound traffic. The existing bridge is a (3) span structure with exterior spans of 38 ft and an interior span of 71 ft spanning Johnson Street for a total bridge length of 147 ft. The existing superstructure is composed of AASHTO Type II Beams for the interior beam of interior spans and AASHTO Type III Beams for exterior spans and exterior beams on interior span. The original bridge structure was built in 1962 and was widened in 1990. A second widening was done in 2020 as part of the I-95 3C DB project.

The existing bridge substructure consists of typical end bents and multi-column intermediate bent. Each multi-column intermediate bent consists of three (3)

column frames supporting the original bridge structure with an independent two (2) column-frame supporting the inside widening. The original end bents were connected during the inside widening making a continuous end bent supporting both structures (860102 and 860202). The outside widening on the northbound and southbound structure were constructed by widening the existing end bents and using an independent two (2) column frame intermediate piers. All columns are 2'-8" diameter and supported on isolated footings with pile foundations. The end bents are supported on pile foundations also. All piles are 18" sq. precast prestressed concrete piles.

The existing bridge structure consists of five six (5) general purpose traffic lanes (2 @ 11 ft and 3 @ 12 ft), two (2) 11ft managed lanes, 10 ft outside shoulder, and 6 ft inside shoulder for an overall roadway width of 99 ft. The existing vertical clearance of the northbound bridge is 14.5 feet which is below the minimum requirement of 16.5 ft and will require a design variation as the proposed widening will maintain the existing vertical clearance. The proposed widening will utilize modified beams if required to maintain the existing vertical clearance.

Figure 4.17 - Bridge 860202 - I-95 NB Over Johnson Street

Proposed Condition

As the widening to the east is only 18.96 ft, the proposed widening would consist of 2-modified AASHTO Type II girders with an 8" thick deck. The girders will be supported on composite neoprene bearing pads. The existing deck will be saw cut along the center line of the exterior beam for the widening. The concrete will

be removed without damaging the existing reinforcement and to allow for splicing of the transverse reinforcement.

The substructure will consist of reinforced concrete end bent extensions and single column piers supported on precast prestressed concrete piles, single drilled shaft or steel H-Piles. Section 6 of the report shows the Concept Plans for this widening.

4.8. Bridge 860529 - SR 9 / I-95 Over Hallandale Beach Boulevard.

Bridge 860529 carries southbound I-95 traffic over Hallandale Beach Boulevard. The existing bridge is a four (4) span structure with end spans of 38 ft and interior spans of 84 ft spanning Hallandale Beach Boulevard for a total bridge length of 244 ft. The existing superstructure is composed of AASHTO Type II Beams for the interior beam of end spans and AASHTO Type IV Beams for interior spans and exterior beams on the end spans. The original bridge structure was built in 1990 and was widened on the northbound and southbound side in 2016 with a single Florida-I 45 beam.

Figure 4.18 - Bridge 860529 - I-95 NB Over Hallandale Beach Blvd.

The existing bridge substructure consists of typical end bents and multi-column intermediate piers. The 2016 outside widening on the southbound structure was constructed by widening the existing end bents and using independent single column intermediate piers founded on steel H-piles (HP18x135). All columns are 3'-0" diameter. The existing bridge structures consist of five (5) general purpose traffic lanes (2 @ 12 ft and 3 @ 11 ft), and an 11 ft managed lane, 12 ft outside shoulder, and 8 ft inside shoulder for an overall roadway width of 91 ft each way. The existing vertical clearance of the southbound bridge is 16.5 ft which meets

the minimum requirement. The proposed widening will utilize modified beams if required to maintain the existing vertical clearance.

Proposed Condition

As the widening to the west is only 12.27 ft, the proposed widening would consist of 2-modified Florida I-Beams with an 8" thick deck. The girders will be supported on composite neoprene bearing pads. The existing deck will be saw cut along the center line of the exterior beam for the widening. The concrete will be removed without damaging the existing reinforcement and to allow for splicing of the transverse reinforcement.

The substructure will consist of reinforced concrete end bent extensions and single column piers supported on precast prestressed concrete piles, single drilled shaft or steel H-Piles. Section 6 of the report shows the Concept Plans for this widening.

4.9. Walls

The roadway approaches to Bridges 1 through 6 and the two additional widenings will require MSE walls to support the proposed roadway due to the right-of-way constraints and no room for embankment slopes. The design and construction of these walls will be complicated by drainage requirements, maintenance of traffic, and various other site-specific challenges. Some of these unique challenges are discussed in more detail below. Additional coordination with other disciplines and the FDOT will be required in later stages of design.

- Significant Temporary Wall Construction – The elevated ramps at the intersections of Hallandale Beach (northbound), Hollywood (northbound/southbound), and Johnson (northbound) require tall MSE walls directly adjacent to I–95. Anchored soldier pile or anchored sheet pile walls will be required to cut the exiting slopes to install the strap lengths required for the proposed MSE walls. The design of these anchored wall systems should consider the maintenance of traffic requirements as well as any necessary equipment clearances and work platforms required for the installation of soil anchors when required.

- Back-to-Back MSE Walls – The narrow single lane roadway approaches may require back-to-back walls. These back-to-back systems should be

coordinated with the Geotechnical Engineer to ensure that the additional requirements of SDG Section 3.13.2 are satisfied.

- MSE Walls Adjacent to the Right-of-Way – The proposed alternative limits right-of-way acquisition by maximizing use of the existing right-of-way. As such, MSE walls are proposed directly adjacent to the existing right-of-way along the roadway approaches to Bridges 1 and 6. Temporary construction easements may be required to facilitate the construction of these walls. FDM Section 211.16 requires a 10 ft maintenance berm in front of the wall face to provide suitable access for maintenance vehicles and inspection.

- MSE Wall Height Limit (40 feet) – The maximum allowable MSE wall height is 40 feet, measured as the vertical distance from the top of the leveling pad to the top of the coping. The walls in the vicinity of Bridge 6 are approaching this limit. During the later stages of design careful attention should be paid to the profile in this area to ensure this limit is not exceeded.

- Previous MSE Wall Widening by Direct Connection to Existing MSE Wall – The portions of MSE Wall along I-95 southbound, to the north and south of Hallandale Beach Boulevard and Pembroke Road were widened by connecting the MSE reinforcing strips directly to the face of the existing MSE wall panels (see **Figure 4.19**). With this connection detail, the newly constructed wall depends entirely on the existing wall for external stability. Based on previous experience and coordination with proprietary wall companies, this type of widening connection cannot be extended in a similar manner. In other words, the panels of a proposed wall cannot be connected directly to the panels of a wall that are directly connected to another wall. The existing wall plans within the project limits should be carefully reviewed for this type of connection. Alternate wall types may need to be investigated at these locations or portions of the existing wall may need to be removed and reconstructed.

- Proposed Ponds/Swales at the Base of Proposed Walls – Swales and ponds located at the base of proposed MSE walls will force leveling pads lower and may trigger coarse aggregate backfill requirements. Pond/swale locations and elevations should be coordinated with the Drainage Engineer. Furthermore, the D4 Maintenance Office should be consulted for any specific maintenance access requirements or concerns.

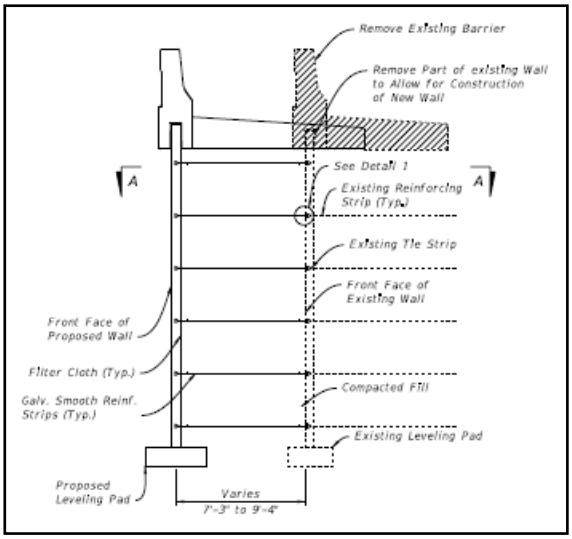


Figure 4.19 – MSE Wall Widening by Direct Connection of Existing MSE Wall

- Excavation for Bridge Foundations at the Base of Existing MSE Walls – Due to the location of proposed bridges, several bridge foundations will need to be constructed in proximity to existing MSE Walls. Excavation for these foundations at the base of the existing MSE wall may adversely affect the external stability of the wall system resulting in global instability. Temporary sheet pile or soldier pile walls will need to be constructed to allow for excavation. Careful attention must be paid to construction vibration impacts to the existing wall during the installation of sheet piles or soldier piles. Pressed in sheet piles or predrilling of the soldier piles will need to be evaluated by the geotechnical Engineer for the design of these walls.

In addition to MSE walls, other more complex permanent wall types will be required at Hallandale Beach Boulevard and Pembroke Road. Currently, drainage ponds/swales are proposed at the base of existing MSE walls in the northeast corner of the Hallandale Beach Boulevard interchange as well as the northwest and southwest corners of the Pembroke Road interchange. Excavating these ponds/swales in front of the existing MSE wall may adversely affect the external stability of the wall system resulting in global instability. The construction of a proposed, taller MSE wall at the existing location would be difficult.

Construction of the wall would require extremely tall temporary walls to excavate for placement of the soil reinforcement. It is likely that the temporary wall would

need to be driven within the reinforced soil mass of the existing wall which would compromise the existing soil reinforcement and wall internal stability. Alternately the temporary wall could be located outside of the existing strap locations, but this will most likely result in negative impacts to the proposed traffic control plan. Viable alternative wall types are limited. One alternative would be to construct a bulkhead wall at the base of the existing MSE wall to allow for the pond/swale excavation. The bulkhead would likely need to be anchored below the existing MSE wall. Another option may be to construct a tall soldier pile wall in front of the existing MSE wall. The soldier pile wall would need to be anchored through cored holes in the MSE wall panels. A concrete fascia wall would be used to match the corridor aesthetics. This type of wall construction is atypical and should be further coordinated with the FDOT Structures Office during the Bridge Development Report phase of the project.

Retaining earth support systems to retain earth at bridge ends in the structures within the project corridor, are slope systems or mechanically stabilized earth (MSE) walls. For the proposed structures, we anticipate that all new bridges, Bridges 1 through 6, will use MSE walls at both of their ends, front and sides. For Bridge 5, the existing Bridge over Hollywood will require to cut its slope at the northwest corner and install MSE wall in order to create the room to fit Bridge 5 end bent and side wall. For Bridge 6, I-95 over Hollywood, the slopes of the existing Bridge will require to cut the slope at the southeast and northeast end and install MSE wall, in order to create the room to fit Bridge 6 end bents and side walls. The widening of the I-95 bridge over Johnson Street (Bridge 860599) will require MSE wall at both southeast and northeast bridge ends, parallel to the existing walls installed in a recent DB project.

As to aesthetics, the proposed walls will match the theme and features of the existing walls along the project corridor.

5. Conclusions and Recommendations

Viable bridge layouts including selection of superstructure type and substructure arrangements have been determined for each bridge location. Bridge layouts have been coordinated with the proposed roadway layout and meet all horizontal and vertical clearance and sight distance requirements. Furthermore, bridge layouts and substructure locations have been reviewed as to their effects on existing utilities and conflicts have been resolved where possible. Given the limited areas available for the location of drainage ponds within the project corridor, the proposed bridge layouts have been coordinated with proposed pond locations and have been designed to clear or minimize impacts to all ponds proposed.

5.1. Preliminary Engineer's Estimate

Probable cost estimates have been prepared for all the bridge structures associated with this project. This cost estimate is based on the cost data available for recently bid projects of similar size and complexity and located directly adjacent to this project along the I-95 corridor. This approach is similar to that used for the cost estimate of the SW 10th Street Interchange on I-95 in Broward County (436964-2-52-01).

The estimate starts with a base square foot bridge price for each bridge type considered. This includes a base price for standard prestressed precast concrete girders, steel plate girders and cast-in-place slab bridges. These unit costs were developed based on cost data for both the Golden Glades Interchange (428358-8-52-01) and the I-95 Express Lanes – Phase 3C (409354-2-52-01) projects which represent the most recent FDOT cost data. These projects are believed to provide accurate cost data as they border this project to the north and south. This unit cost is then adjusted for inflation taken at 3% for a 4-year period to arrive at an adjusted unit cost per square foot. The adjusted unit cost is then further modified for any additional bridge complexities associated with a particular bridge unit. It is important to distinguish that these modifications were only applied to the specific bridge unit affected and not to the overall bridge which could greatly skew the cost for the longer structures. These additional modifications include adjustments for phased construction, construction over traffic and unusual framing such as integral straddle bents. The costs are broken down in the standard fashion for Long Range Estimates associated with planning studies. Quantities are developed for bridges per square foot with a unit cost, removal of existing bridges per square foot, Approach Slab concrete per square yard, and Approach Slab Reinforcing in pounds of steel. These costs are summarized in the Bridge Cost Table included in Appendix A. Further economy of bridge structures will be

explored during the Bridge Development Phase. These costs represent budgetary estimates for just one possible, likely structural solution.

The probable cost per structure is listed in **Table 5.1** below. These costs are for the bridges only and do not include the cost of the walls. Accurate wall lengths cannot be determined with the information available at this time.

Table 5.1 – Bridge Cost Summary

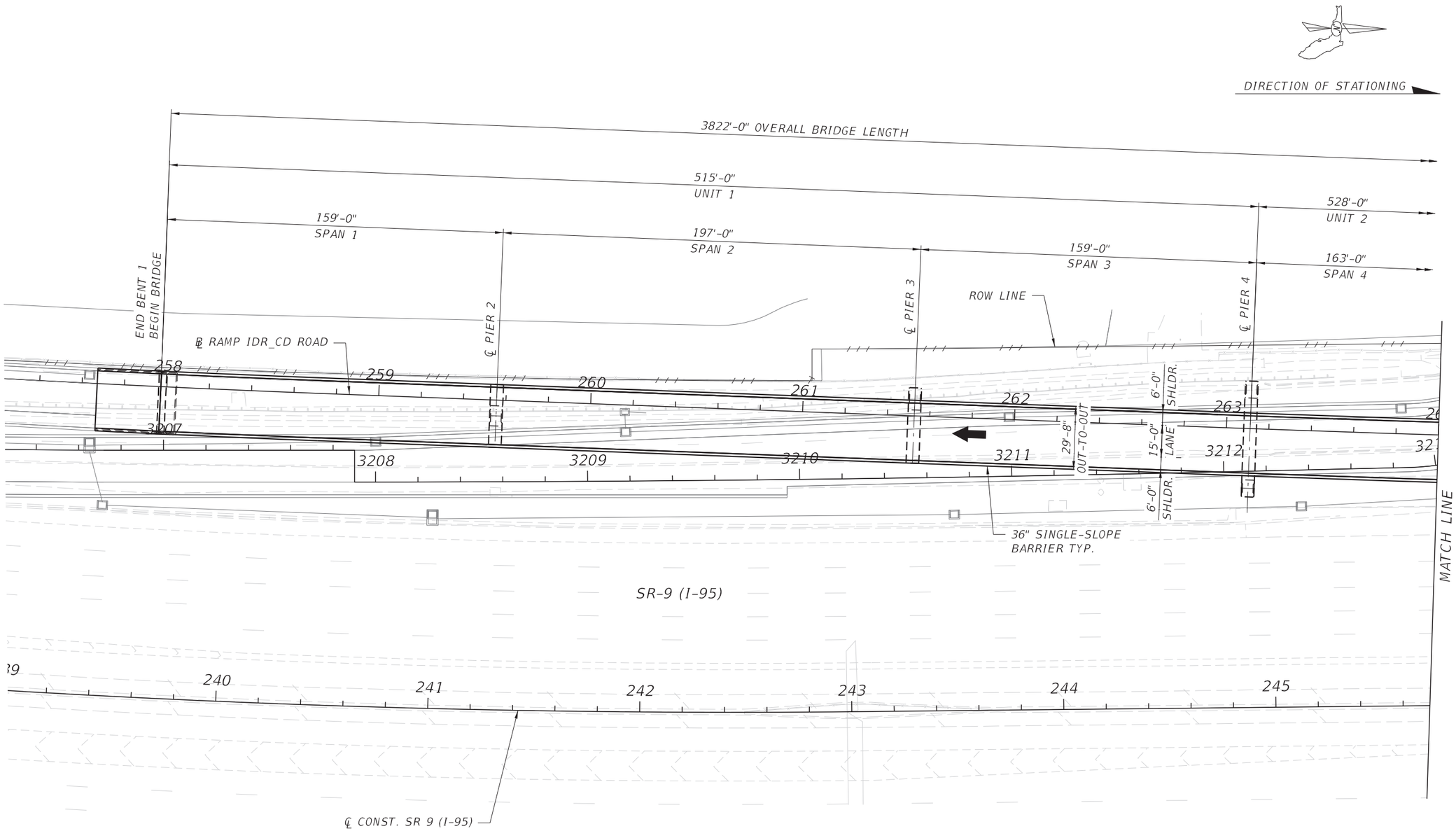
Bridge No.	Description	Total Estimated Cost
1	SB Ramp from Pembroke Rd to I-95 over Hallandale Beach Boulevard	$ 60,520,000
2	NB Ramp from NB I-95 to Pembroke Rd over NB On-Ramp from Hallandale Beach Boulevard	$ 25,165,000
3	SB Ramp from Hollywood Boulevard to Pembroke Road	$ 9,711,000
4	SB Ramp from I-95 SB to Pembroke Rd over SB On-Ramp from Hollywood Boulevard	$ 4,541,000
5	SB Ramp from I-95 SB to Pembroke Rd over Hollywood Boulevard	$ 1,794,000
6	NB Ramp from Pembroke Rd I-95 NB over Hollywood Boulevard	$ 1,794,000
7	NB I-95 over Johnson Street	$ 830,000
8	SB I-95 over Hallandale Beach Boulevard	$ 995,000
Total		**$ 105,350,000**

5.2. Recommendations

The total probable cost of the bridge structures associated with the Refined Preferred Alternative is **$105,350,000.**

6. Conceptual Plans

This section presents the Conceptual Plans for the structures. These plans show the plan view of all structures along the project corridor.



PLAN

BRIDGE NO. 1

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

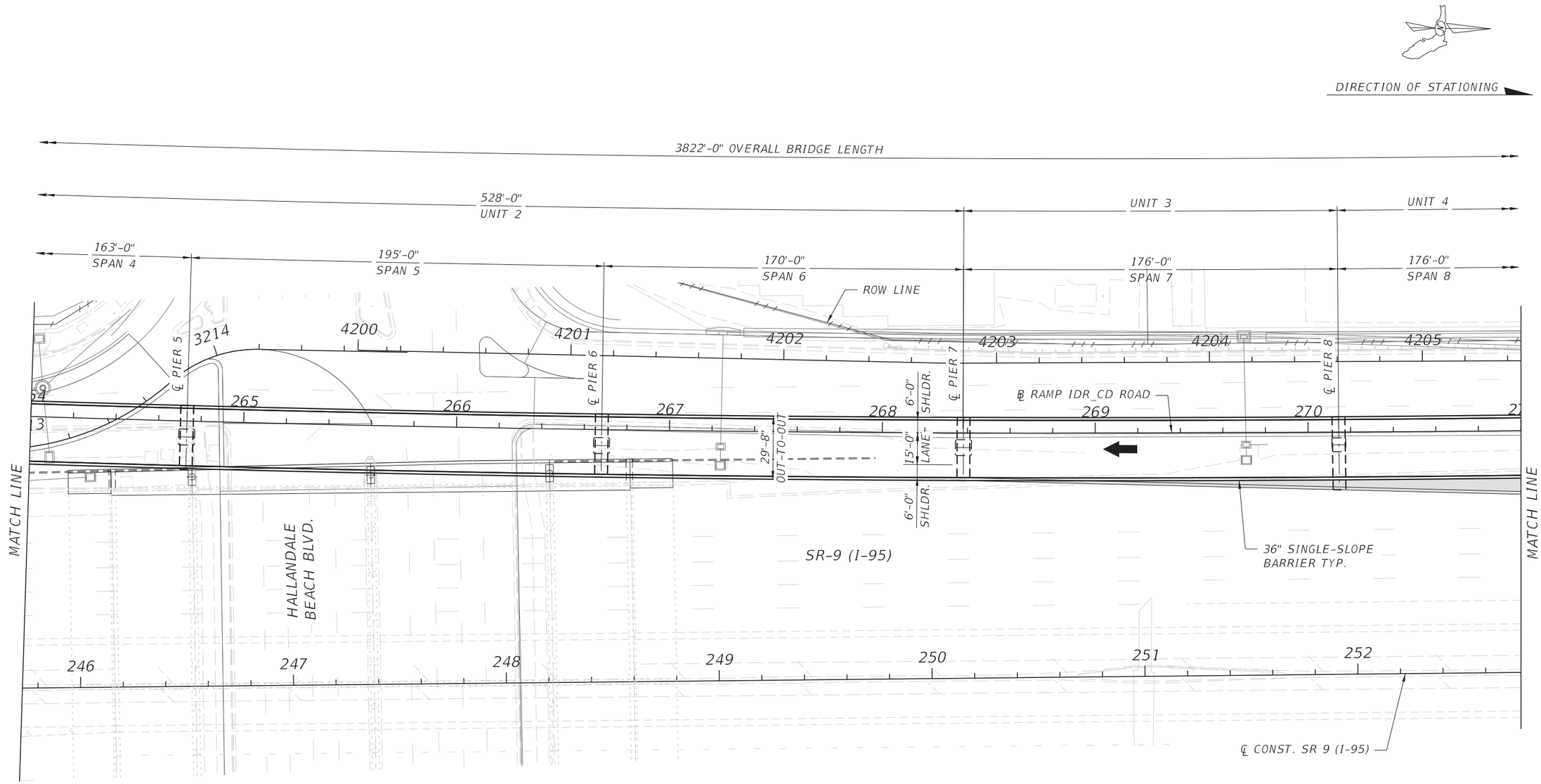
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (1 OF 6)

REF. DWG. NO.

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO. B1-1



PLAN

LEGEND:

FUTURE RAMP

BRIDGE NO. 1

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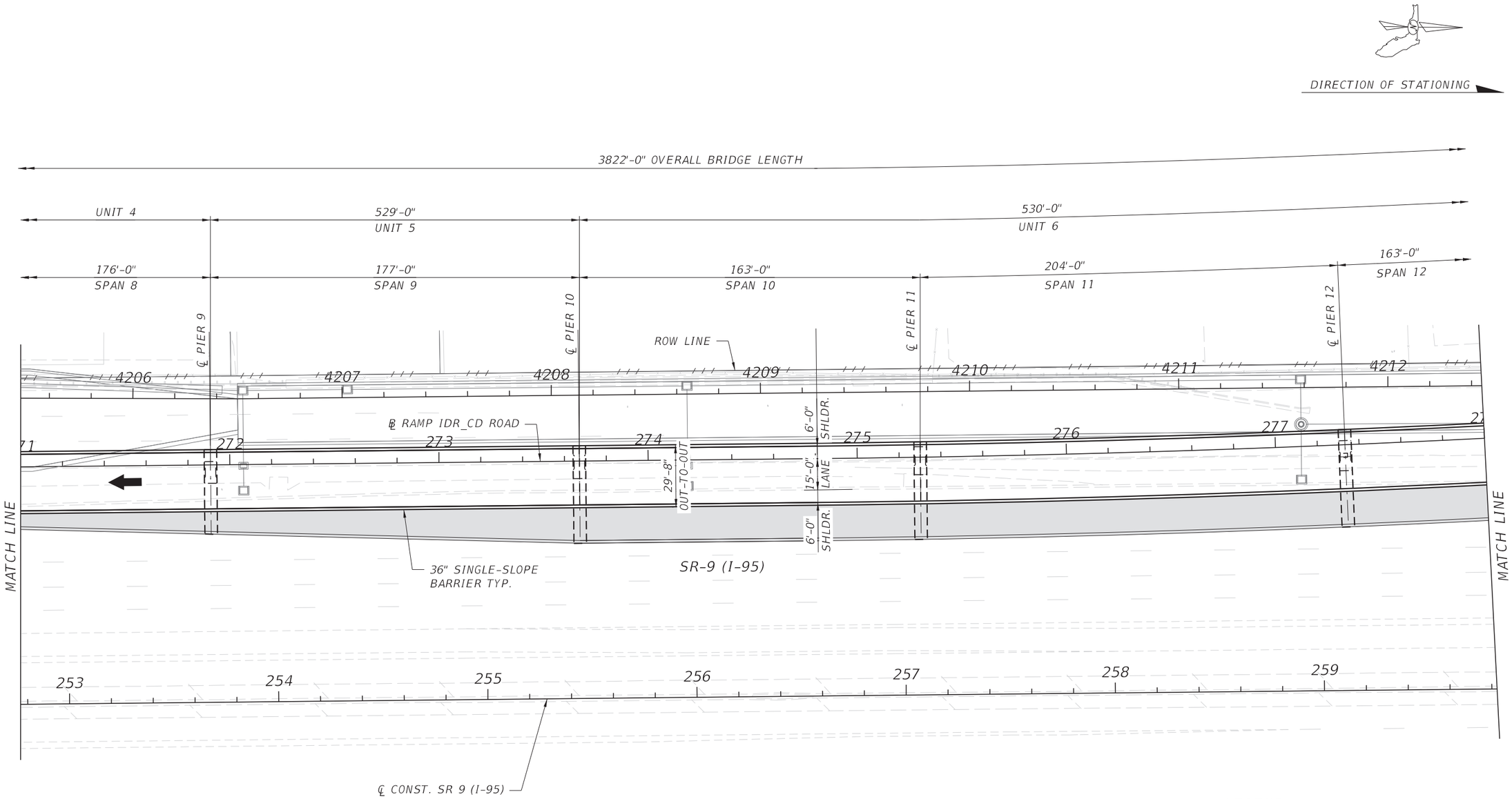
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (2 OF 6)

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B1-2



PLAN

LEGEND:

FUTURE RAMP

BRIDGE NO. 1

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SHEET TITLE: BRIDGE PLAN VIEW (3 OF 6)

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PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

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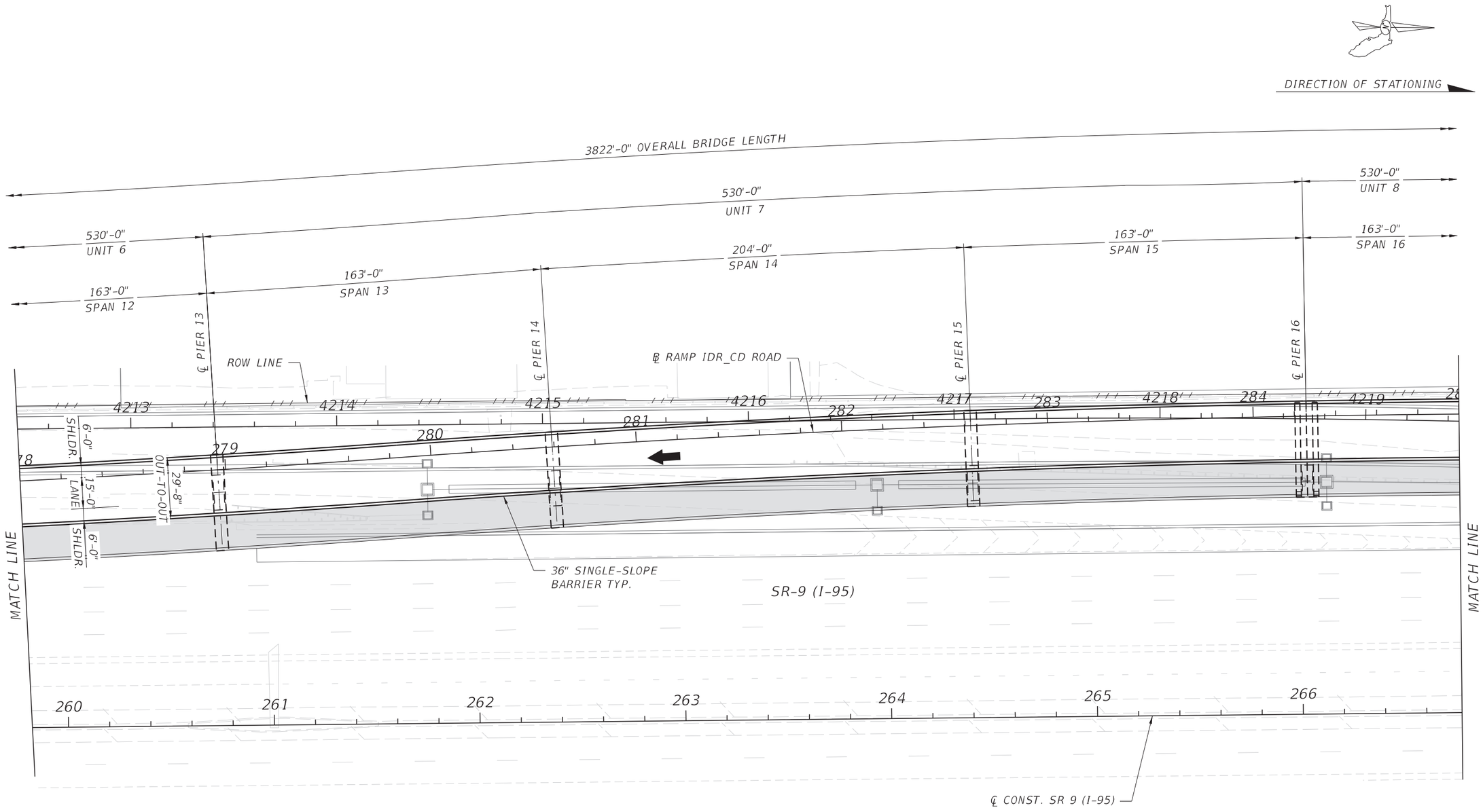

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LEGEND:

FUTURE RAMP

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SHEET TITLE: BRIDGE PLAN VIEW (4 OF 6)

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

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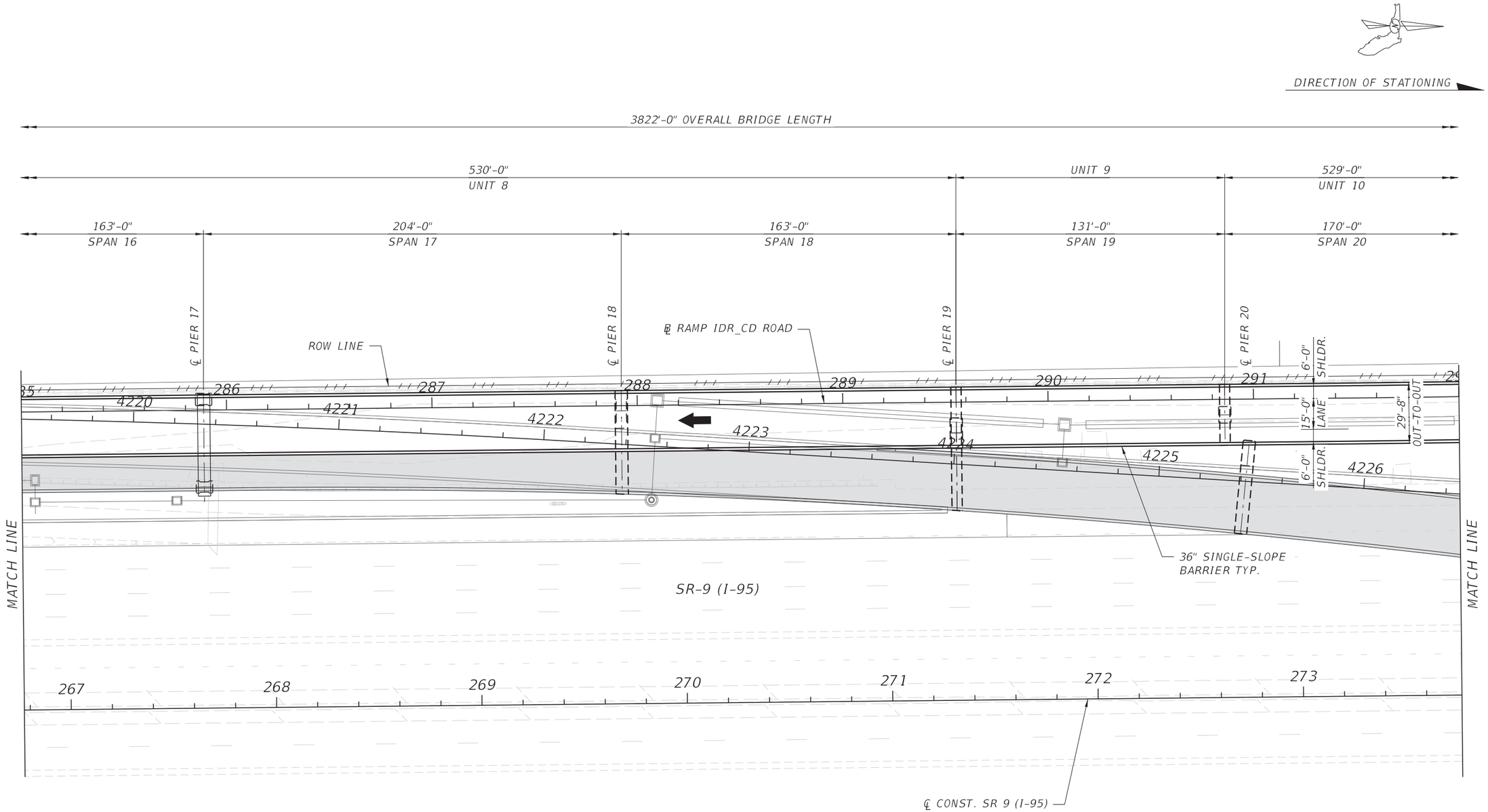

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FUTURE RAMP

BRIDGE NO. 1

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SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (5 OF 6)

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PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

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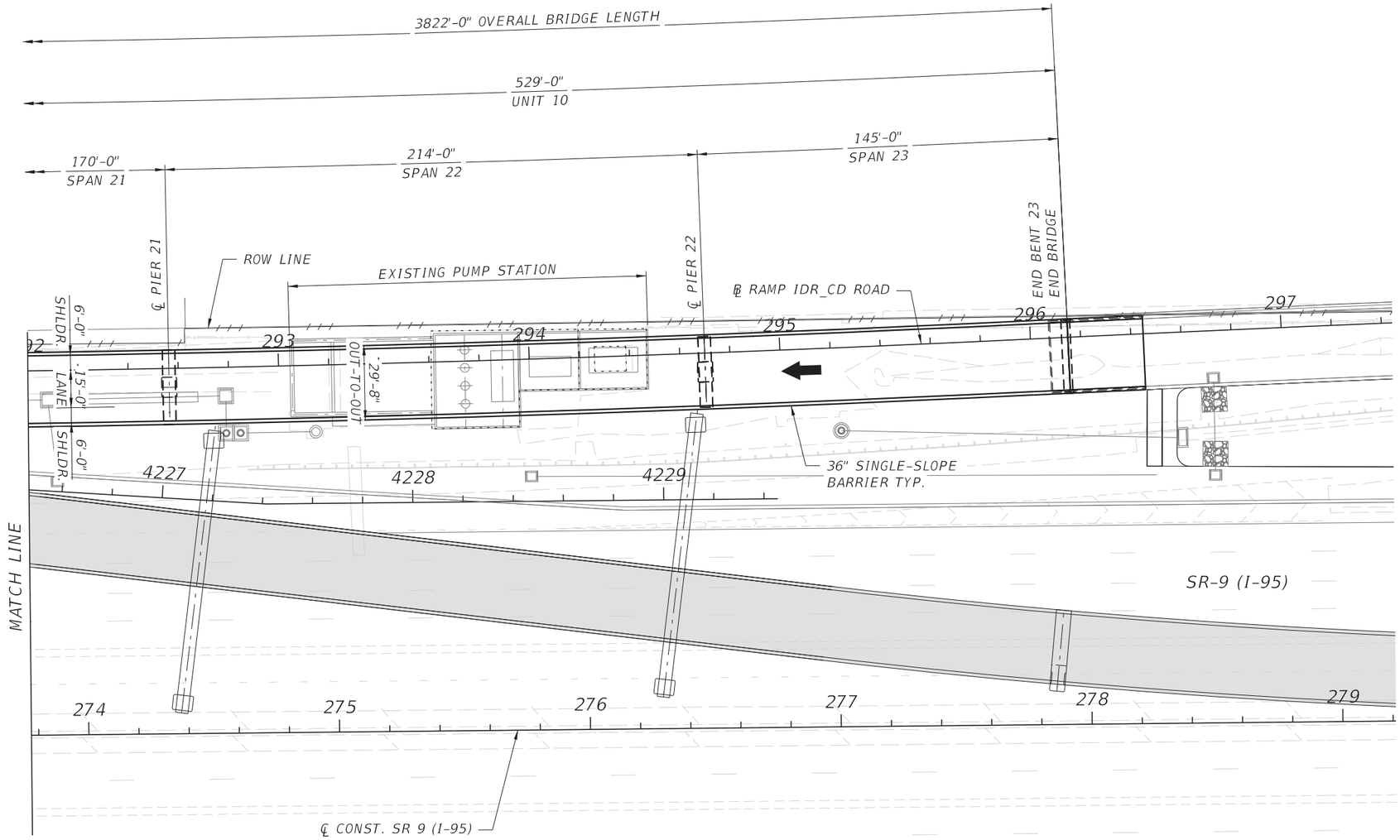

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LEGEND:

FUTURE RAMP

BRIDGE NO. 1

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SHEET TITLE: BRIDGE PLAN VIEW (6 OF 6)

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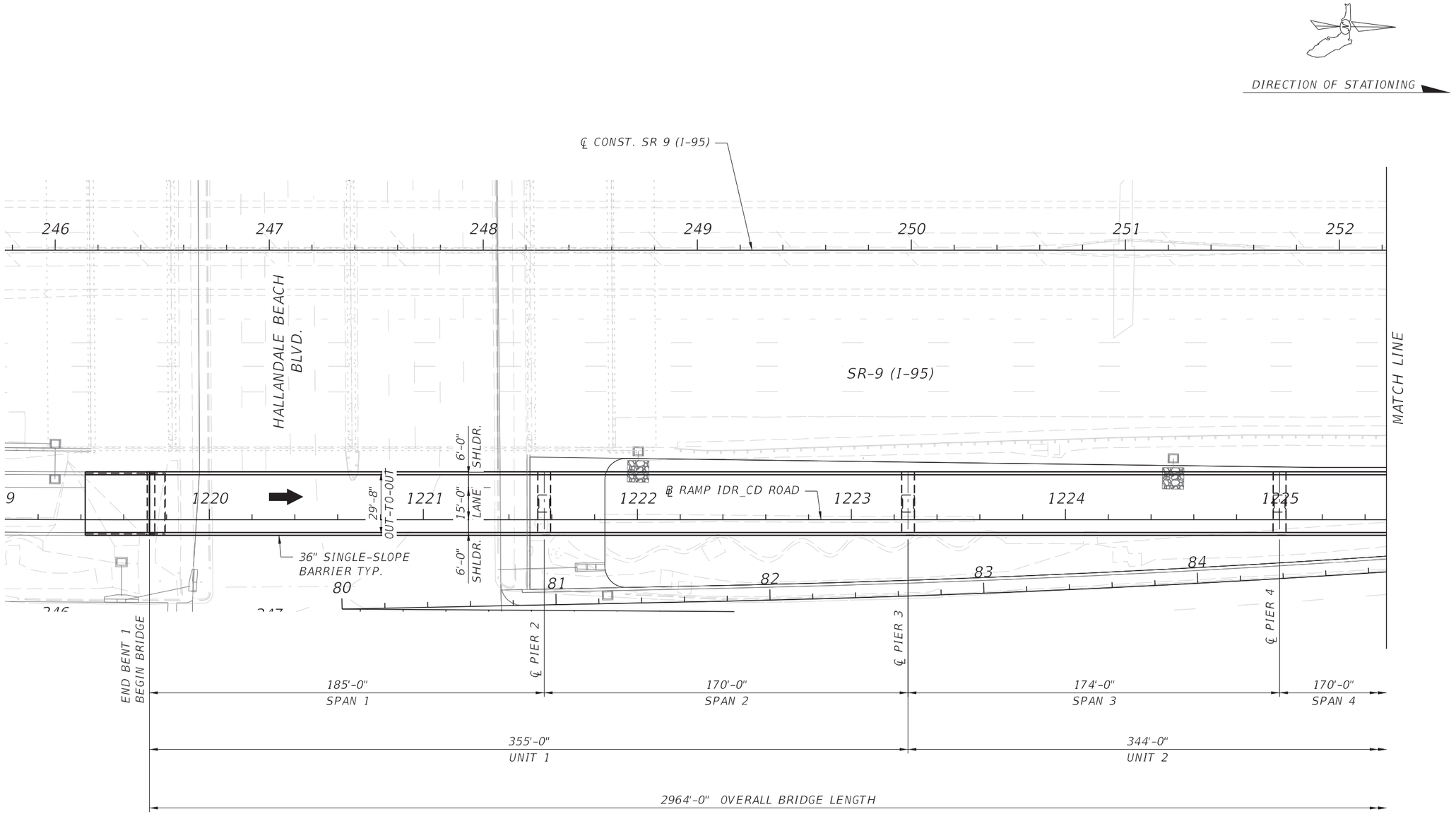

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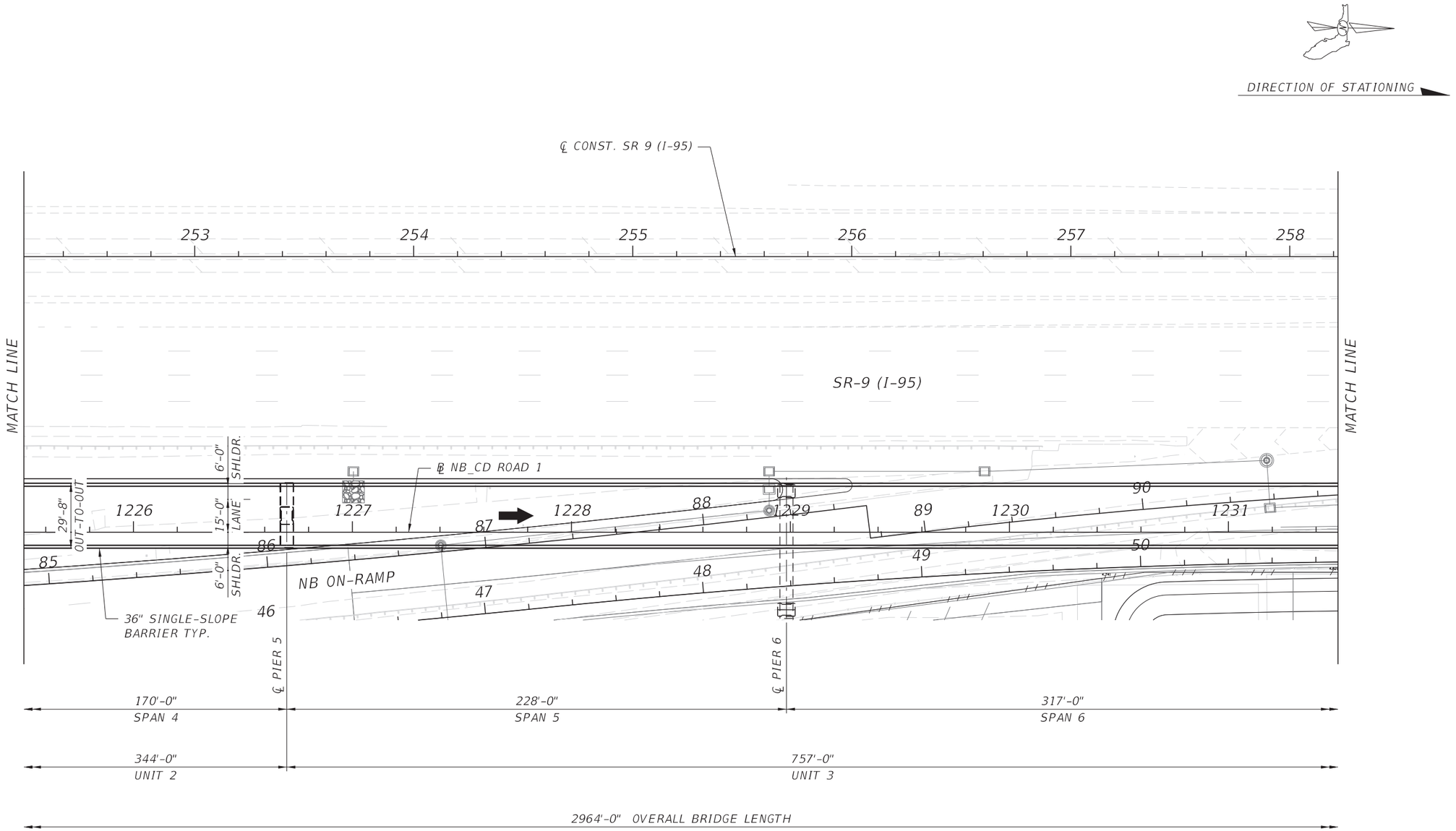
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (1 OF 5)

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B2-1



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SHEET TITLE: BRIDGE PLAN VIEW (2 OF 5)

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PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

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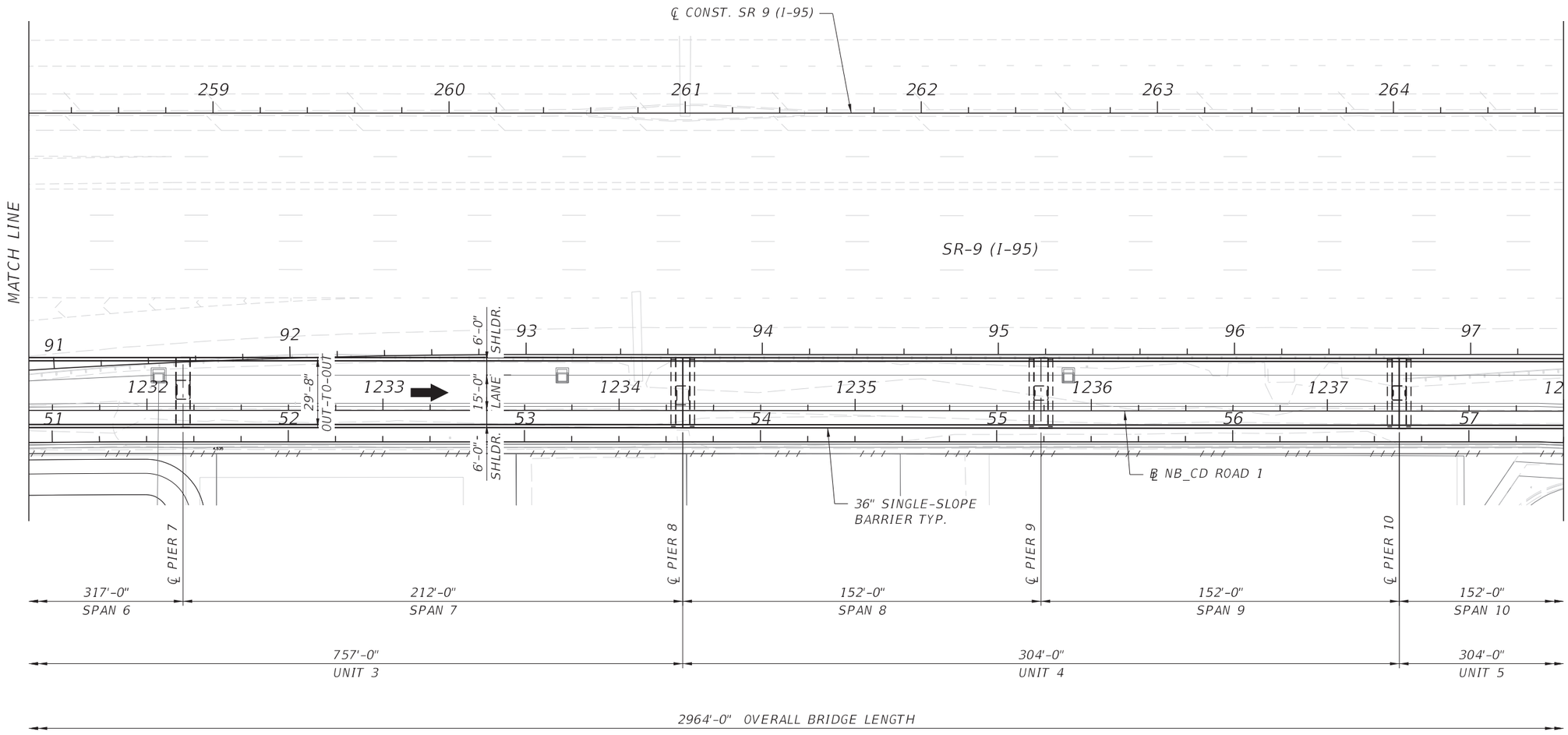

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BRIDGE NO. 2

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ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (3 OF 5)

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

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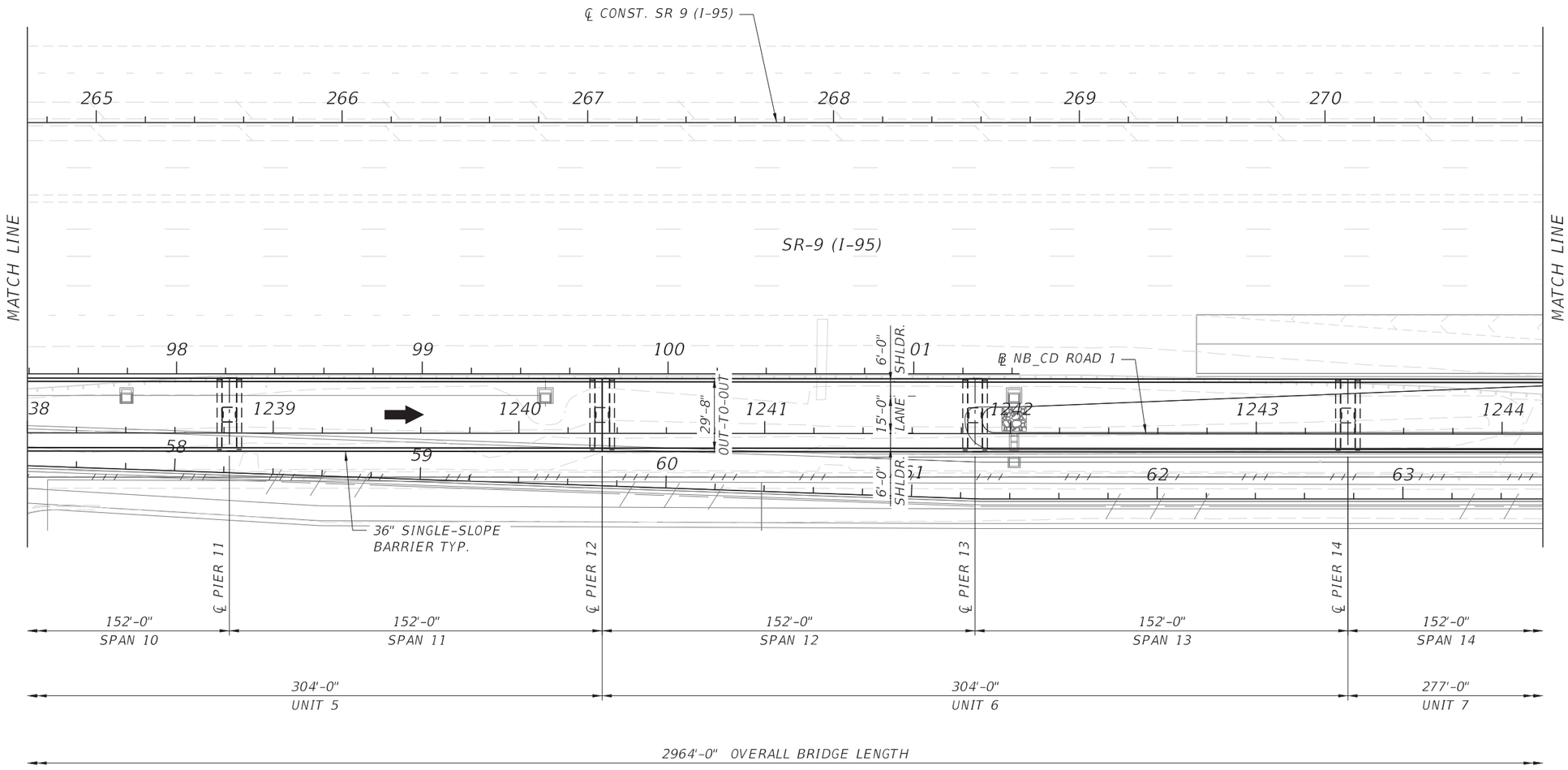
DIRECTION OF STATIONING



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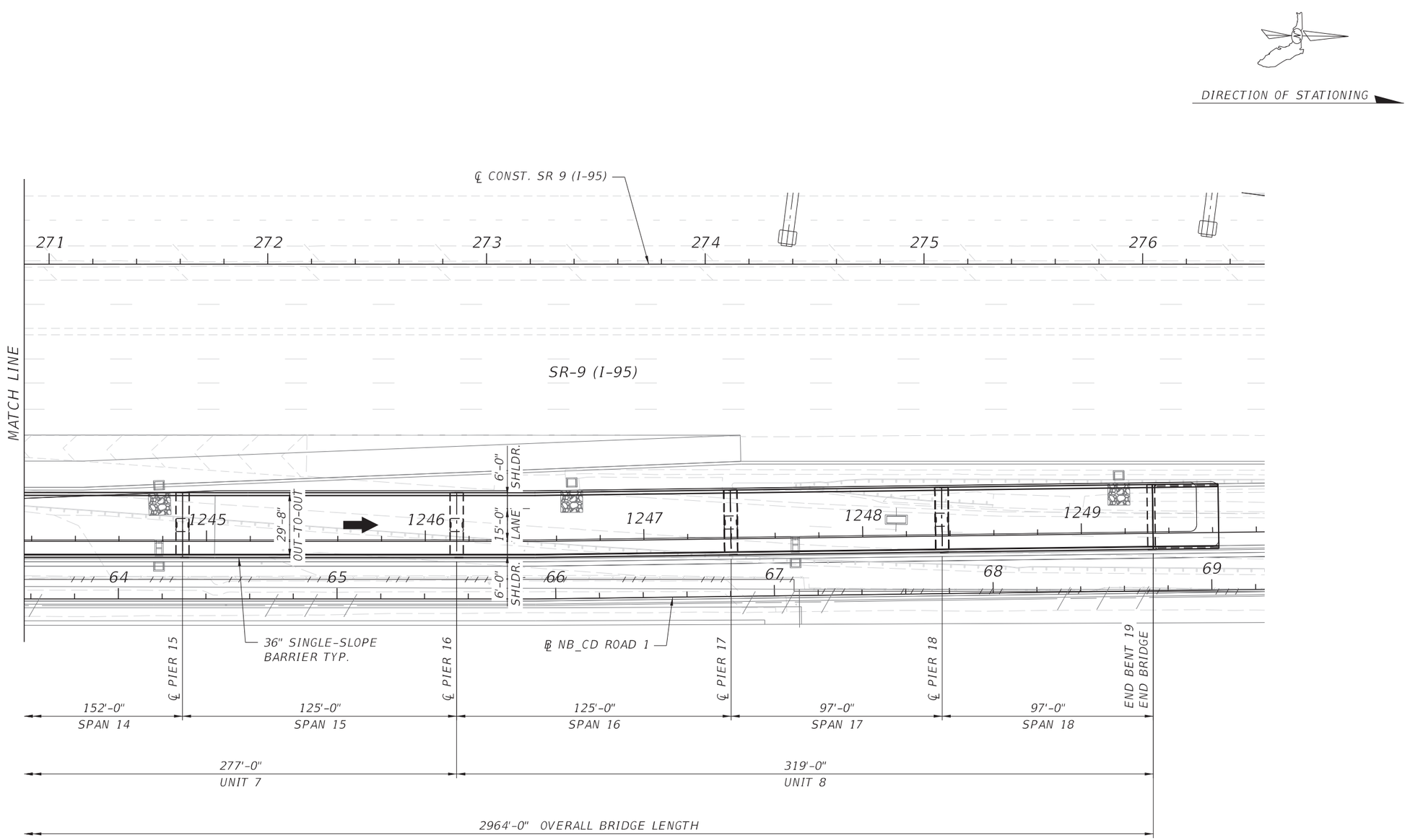
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (4 OF 5)

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B2-4



PLAN

BRIDGE NO. 2

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

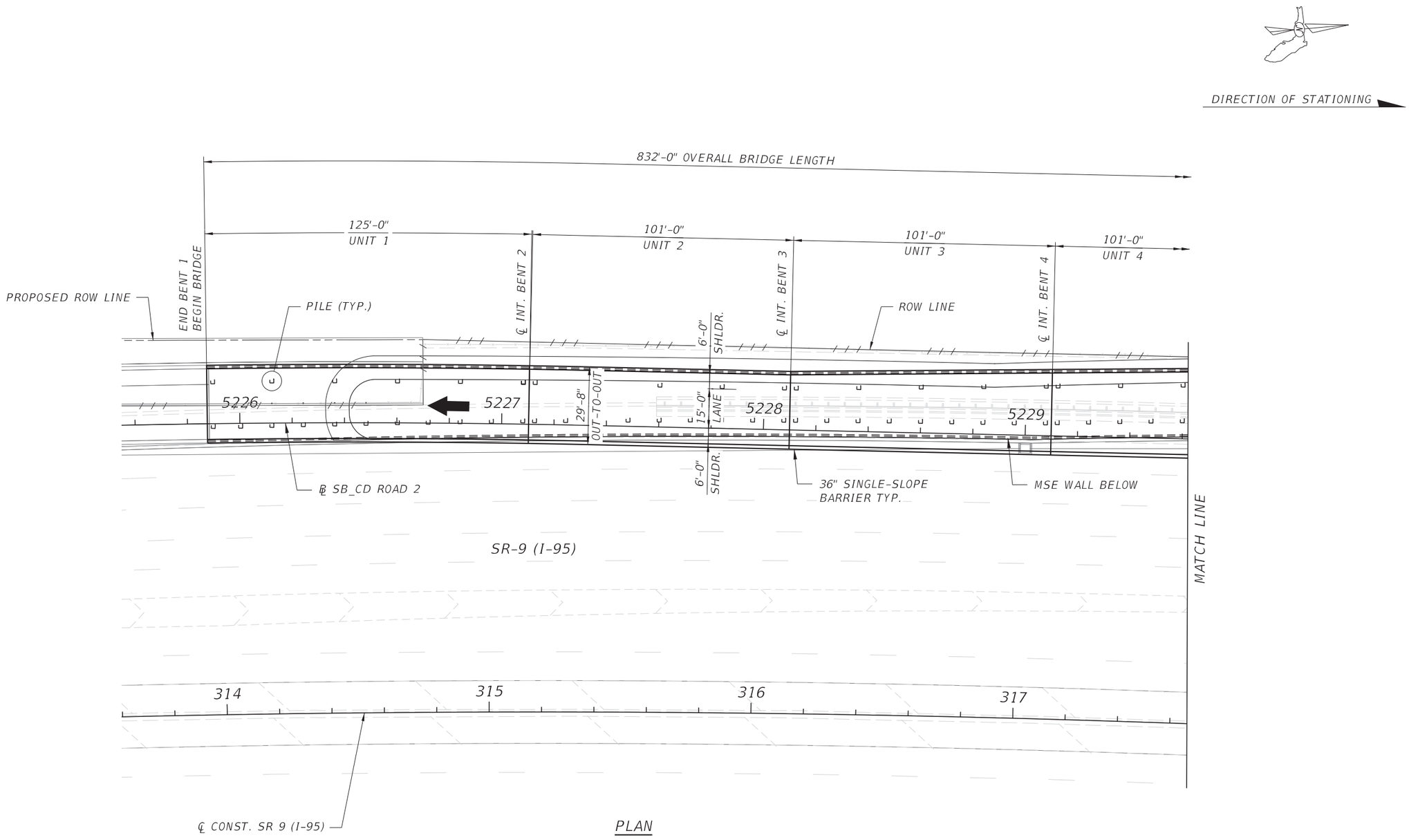
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (5 OF 5)

REF. DWG. NO.

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO. B2-5



PLAN

BRIDGE NO. 3

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

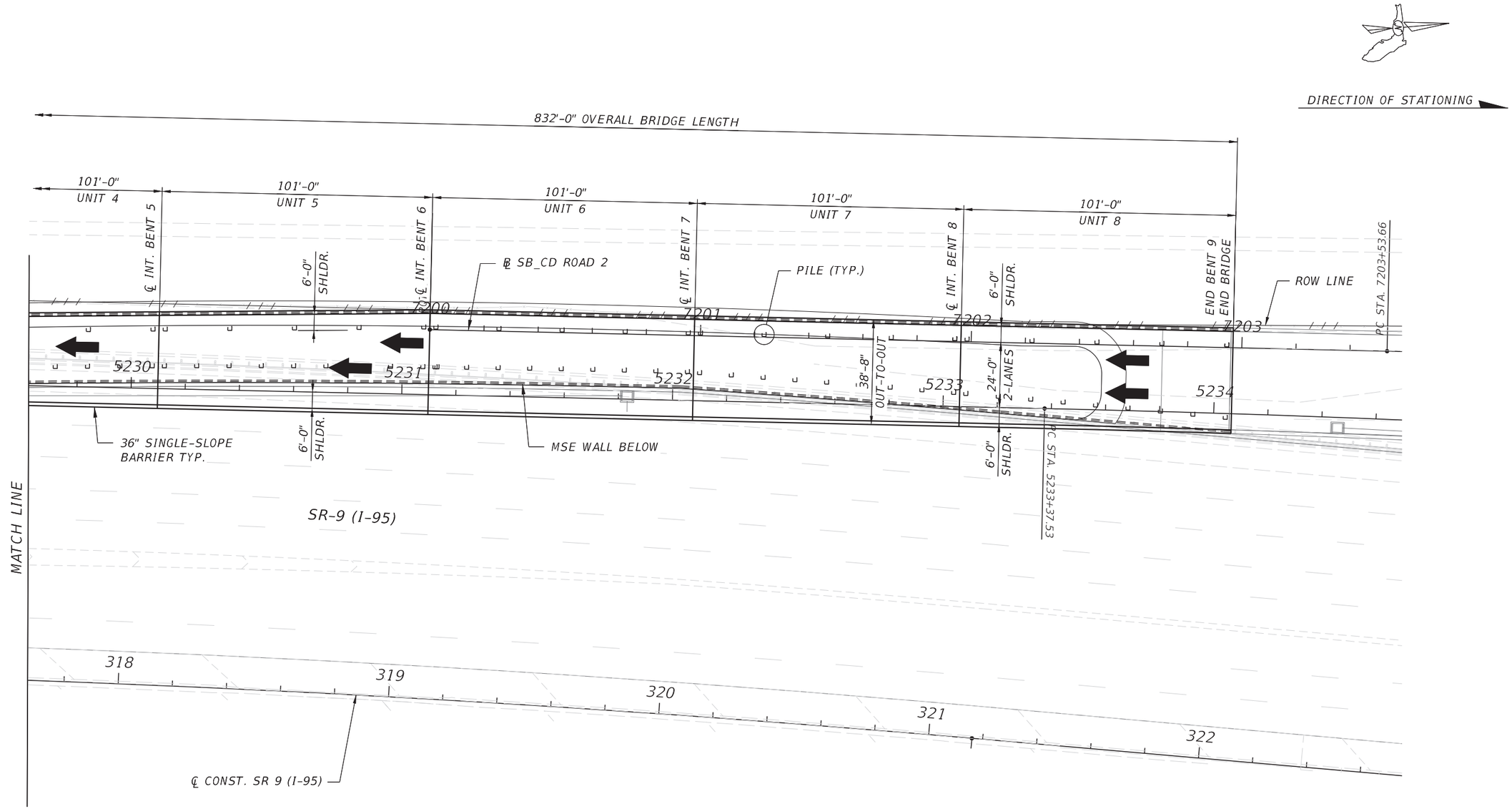
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (1 OF 2)

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B3-1



PLAN

BRIDGE NO. 3

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

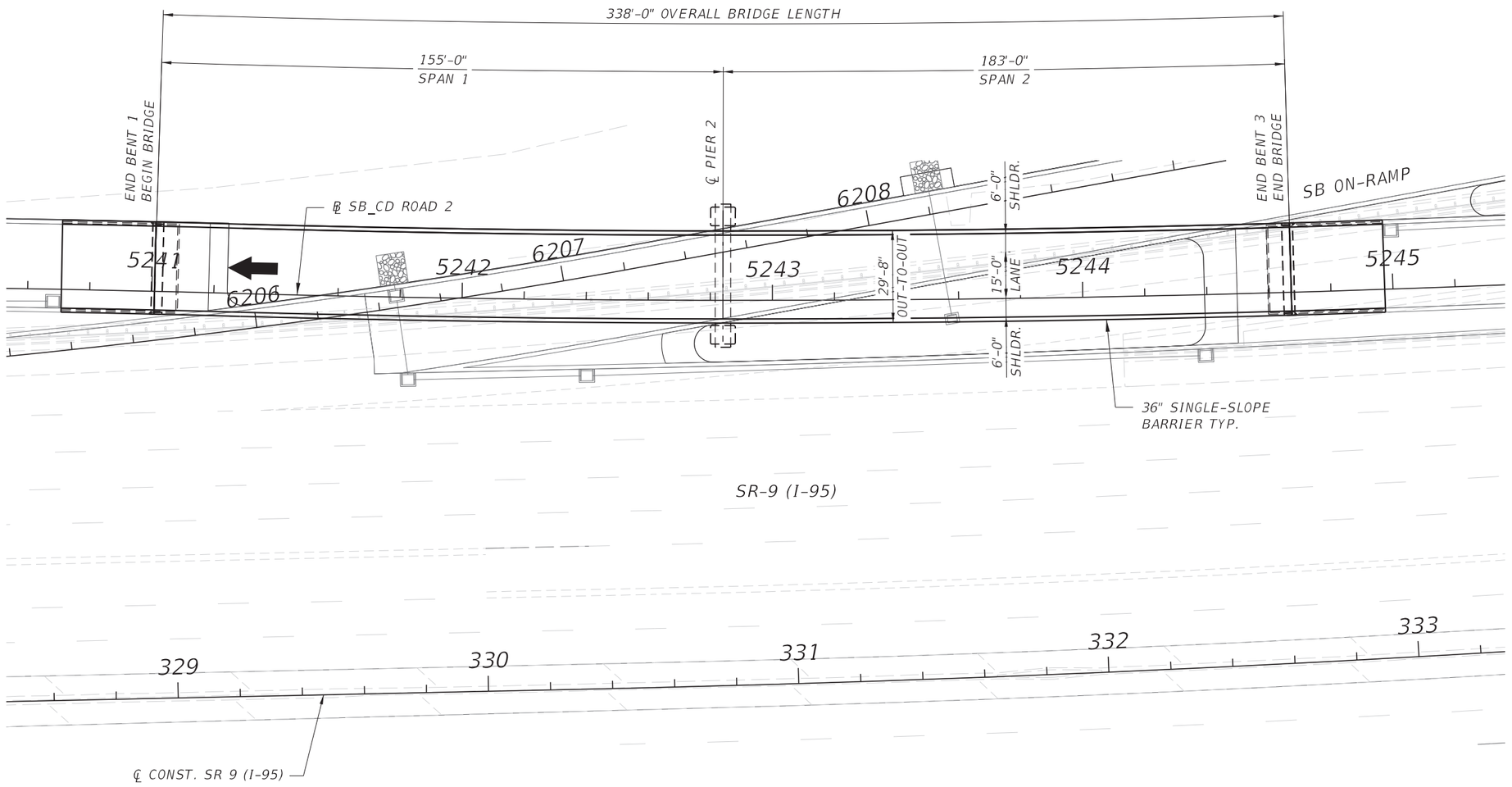
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW (2 OF 2)

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B3-2



PLAN

BRIDGE NO. 4

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

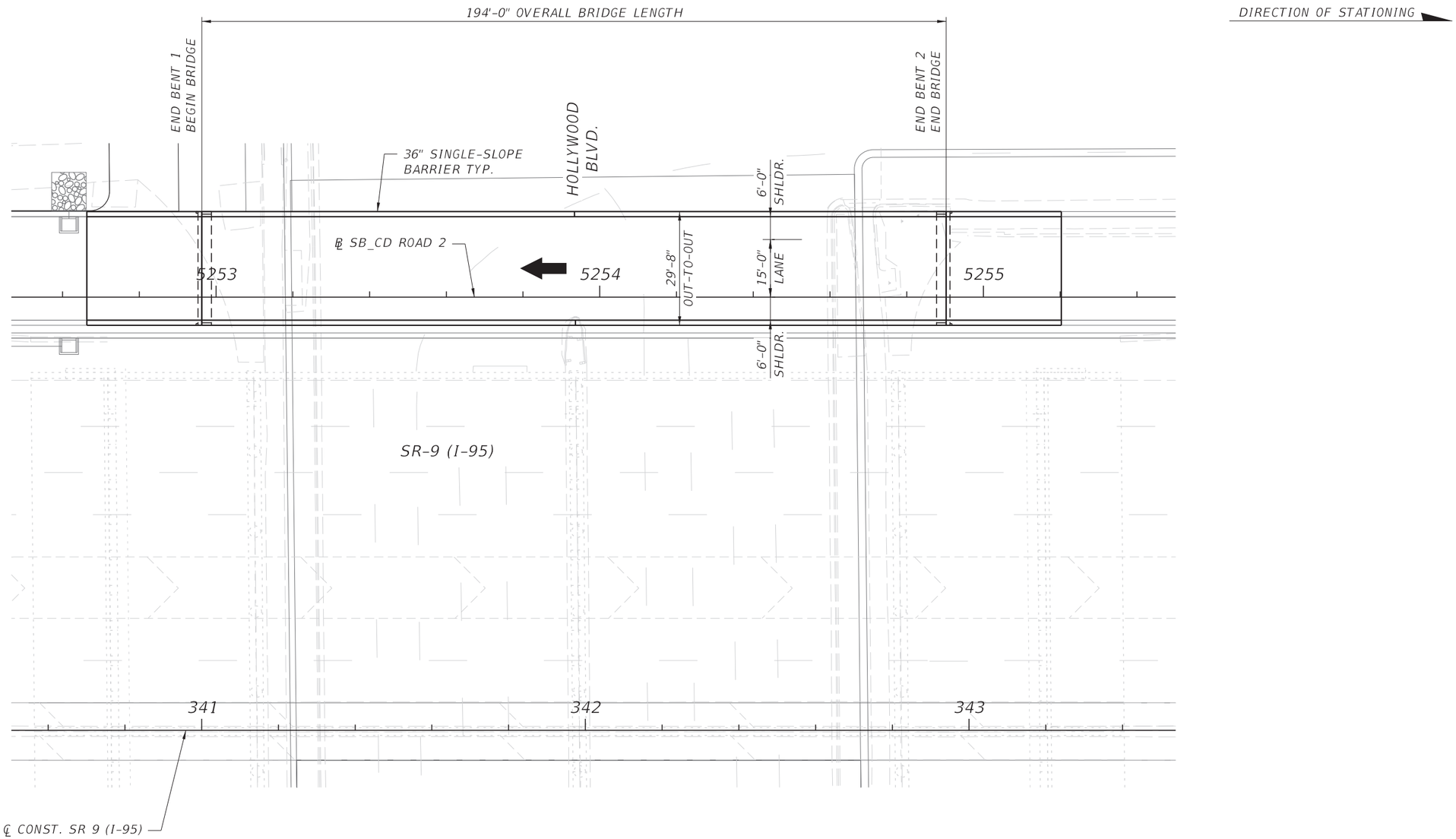
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW

REF. DWG. NO.

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO. B4-1



DIRECTION OF STATIONING

PLAN

BRIDGE NO. 5

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

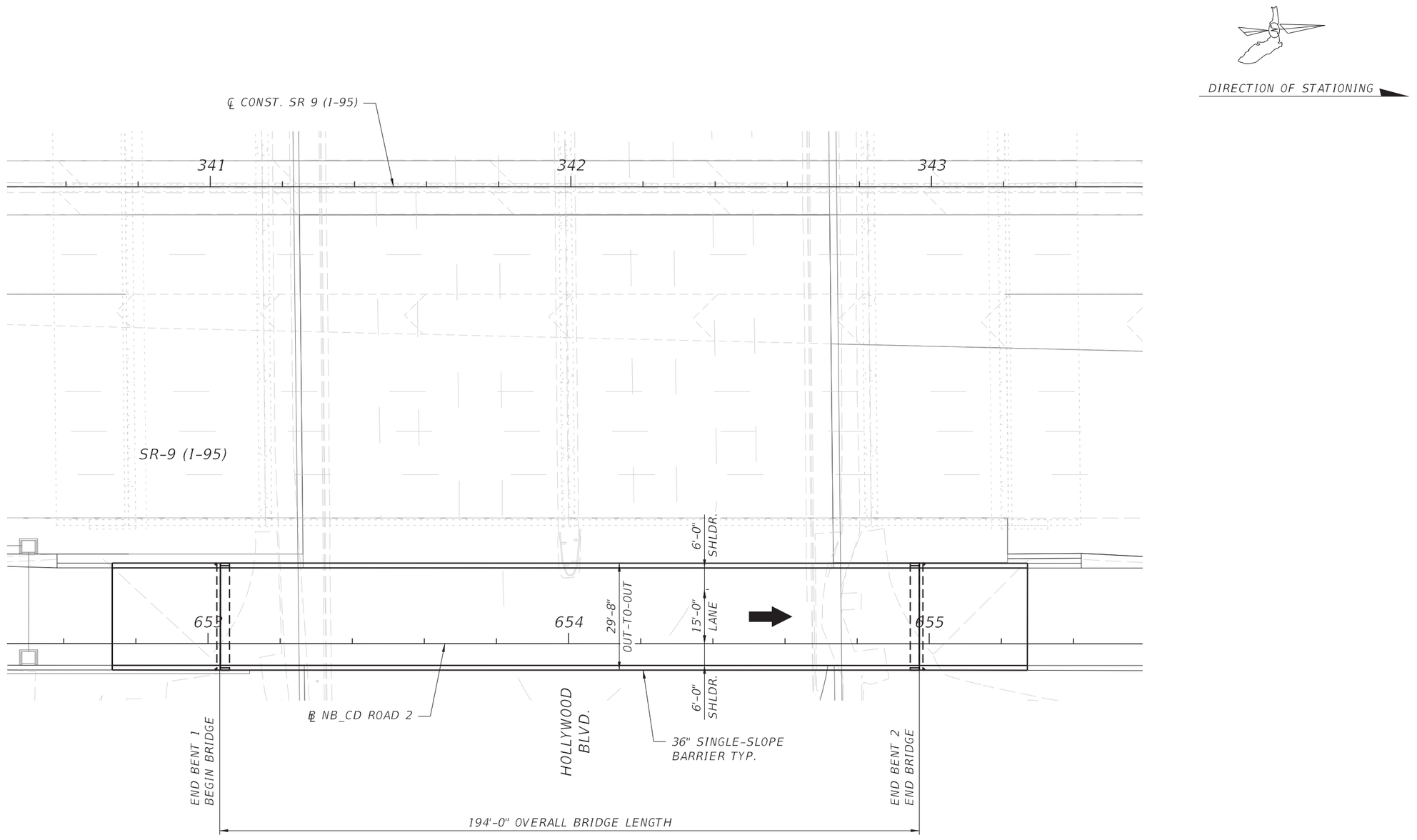
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B5-1



PLAN

BRIDGE NO. 6

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

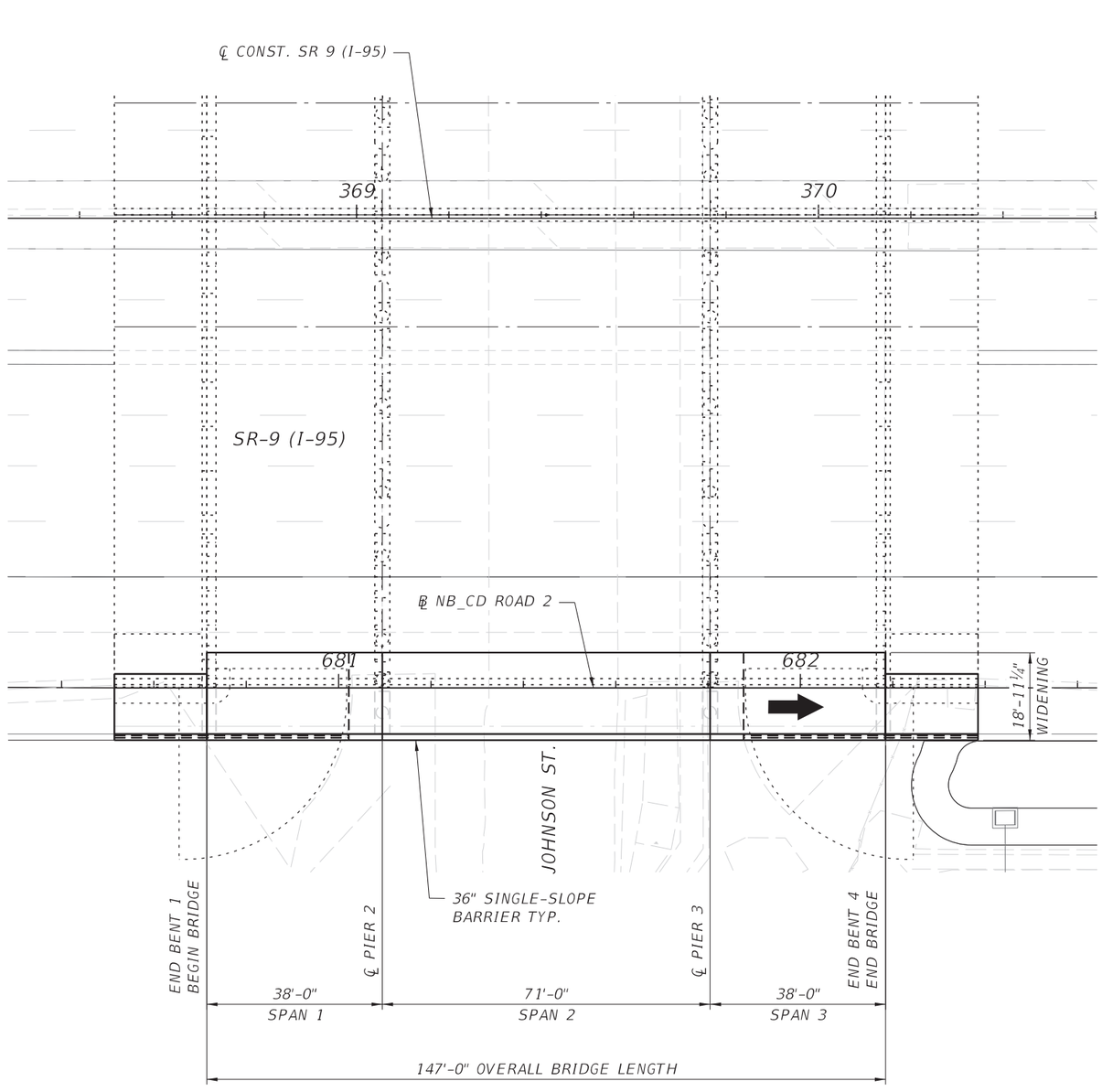
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B6-1



DIRECTION OF STATIONING

PLAN

BRIDGE NO. 7

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

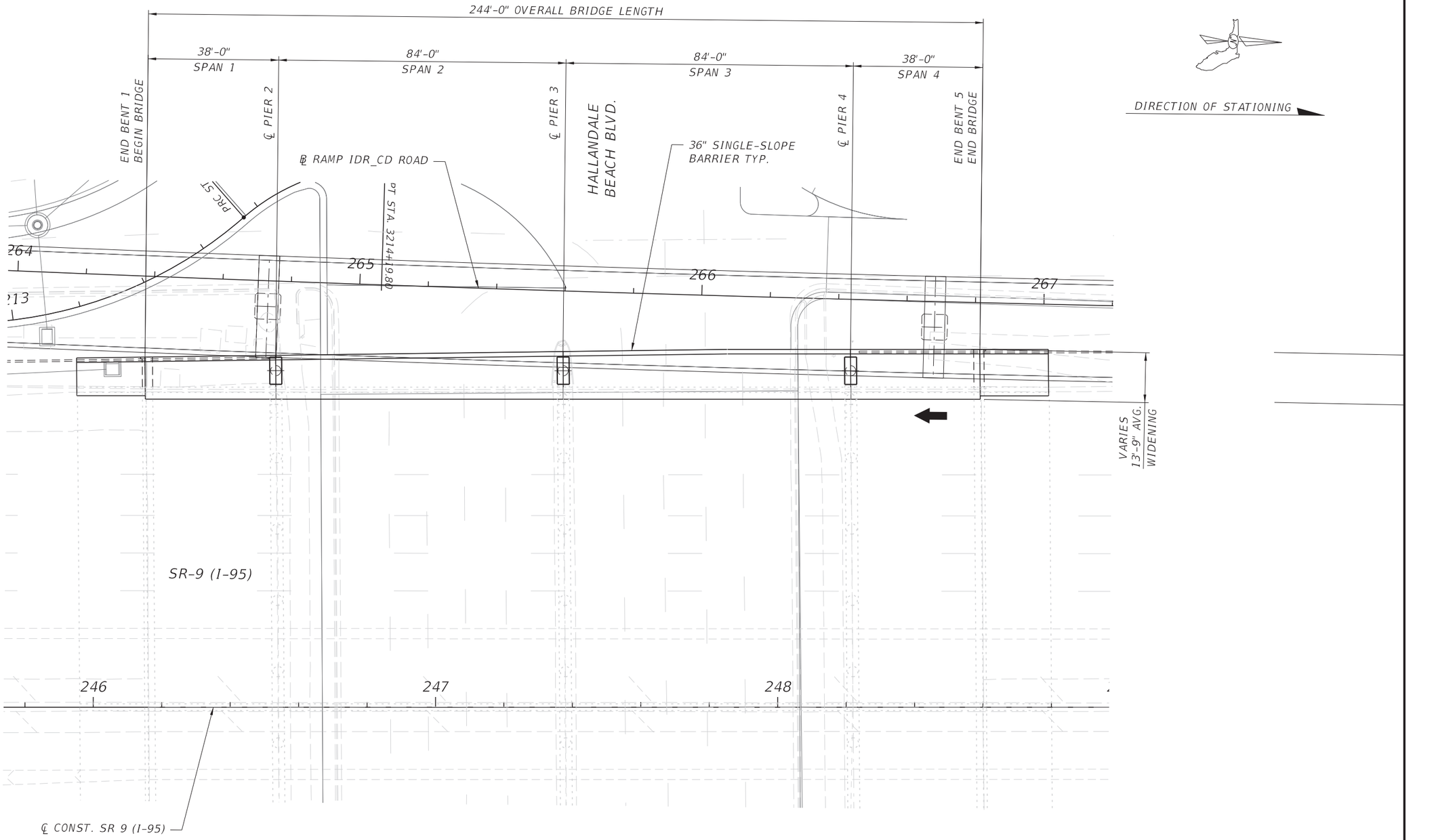
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B7-1



PLAN

BRIDGE NO. 8

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9	BROWARD	436903-1-52-01

SHEET TITLE: BRIDGE PLAN VIEW

REF. DWG. NO.:

PROJECT NAME: I-95 FROM HALLANDALE BEACH BLVD. TO JOHNSON ST.

SHEET NO.: B8-1

7. Appendix A: Bridge Cost Table

I-95 and Hollywood/Hallandale Project - Bridge Construction Cost Summary Table

Bridge No.	Bridge Description	Bridges Component	Number of Spans	Length (ft)	Width (ft)	Area (ft^2)	Volume (CY) Weight (LB) [2]	Base Price / ft^2 [1]	Curvature Factor	Straddle Pier Factor	Over Traffic Factor	Phased Construction Factor	Discretionary Factor	Total Cost Factor	Factored Price / ft^2	Total
1	SB Ramp from Pembroke Road to I-95 over Hallandale Beach Boulevard	Steel Plate Girder	22	3,822.00	29.667	113,386	-	$ 446.10	1.15	1.01	1.03	1.00	1.01	1.20	$ 533.38	$ 60,478,044.80
		Approach Slabs - Concrete	2	30.00	29.667	1,780	65.93	$ 450.00	1.00	1.00	1.00	1.00	1.00	1.00	$ 450.00	$ 29,666.67
		Approach Slabs - Reinf. Steel	2	30.00	29.667	1,780	13,185.19	$ 1.18	1.00	1.00	1.00	1.00	1.00	1.00	$ 1.18	$ 15,575.00
2	NB Ramp from NB I-95 to Pembroke Road over Hallandale Beach Boulevard and Northbound On-Ramp From Hallandale Beach Blvd	Florida I-Beam	15	2,207.00	29.667	65,474	-	$ 249.94	1.00	1.00	1.00	1.00	1.00	1.00	$ 249.94	$ 16,364,763.75
		Steel Plate Girder	3	757.00	29.667	22,458	-	$ 371.25	1.00	1.05	1.00	1.00	1.00	1.05	$ 389.81	$ 8,754,279.19
		Approach Slabs - Concrete	2	30.00	29.667	1,780	65.93	$ 450.00	1.00	1.00	1.00	1.00	1.00	1.00	$ 450.00	$ 29,666.67
		Approach Slabs - Reinf. Steel	2	30.00	29.667	1,780	13,185.19	$ 1.18	1.00	1.00	1.00	1.00	1.00	1.00	$ 1.18	$ 15,575.00
3	SB Ramp from Hollywood Boulevard to Pembroke Road	Pile Supported Slab	8	832.00	34.583	28,773	-	$ 337.50	1.00	1.00	1.00	1.00	1.00	1.00	$ 337.50	$ 9,710,943.75
		Approach Slabs - Concrete	1	-	0.000	-	-	$ 450.00	1.00	1.00	1.00	1.00	1.00	1.00	$ 450.00	$ -
		Approach Slabs - Reinf. Steel	1	-	0.000	-	-	$ 1.18	1.00	1.00	1.00	1.00	1.00	1.00	$ 1.18	$ -
4	SB Ramp from I-95 SB to Pembroke Road over SB On-Ramp from Hollywood Boulevard	Steel Plate Girder	2	338.00	29.667	10,027	-	$ 371.25	1.15	1.05	1.00	1.00	1.00	1.21	$ 448.28	$ 4,495,096.86
		Approach Slabs - Concrete	2	30.00	29.667	1,780	65.93	$ 450.00	1.00	1.00	1.00	1.00	1.00	1.00	$ 450.00	$ 29,666.67
		Approach Slabs - Reinf. Steel	2	30.00	29.667	1,780	13,185.19	$ 1.18	1.00	1.00	1.00	1.00	1.00	1.00	$ 1.18	$ 15,575.00
5	SB Ramp from I-95 SB to Pembroke Road over Hollywood Boulevard	Florida I-Beam	1	194.00	29.667	5,755	-	$ 303.75	1.00	1.00	1.00	1.00	1.00	1.00	$ 303.75	$ 1,748,182.50
		Approach Slabs - Concrete	2	30.00	29.667	1,780	65.93	$ 450.00	1.00	1.00	1.00	1.00	1.00	1.00	$ 450.00	$ 29,666.67
		Approach Slabs - Reinf. Steel	2	30.00	29.667	1,780	13,185.19	$ 1.18	1.00	1.00	1.00	1.00	1.00	1.00	$ 1.18	$ 15,575.00
6	NB Road from Pembroke Road I-95 NB over Hollywood Boulevard	Florida I-Beam	1	194.00	29.667	5,755	-	$ 303.75	1.00	1.00	1.00	1.00	1.00	1.00	$ 303.75	$ 1,748,182.50
		Approach Slabs - Concrete	2	30.00	29.667	1,780	65.93	$ 450.00	1.00	1.00	1.00	1.00	1.00	1.00	$ 450.00	$ 29,666.67
		Approach Slabs - Reinf. Steel	2	30.00	29.667	1,780	13,185.19	$ 1.18	1.00	1.00	1.00	1.00	1.00	1.00	$ 1.18	$ 15,575.00
7	NB I-95 over Johnson Street	Florida I-Beam Widening	3	147.00	18.958	2,787	-	$ 225.00	1.00	1.00	1.00	1.20	1.00	1.20	$ 270.00	$ 752,456.25
		Approach Slabs - Concrete	2	20.00	18.958	758	28.09	$ 450.00	1.00	1.00	1.00	1.20	1.00	1.20	$ 540.00	$ 15,166.67
		Approach Slabs - Reinf. Steel	2	20.00	18.958	758	5,617.28	$ 1.18	1.00	1.00	1.00	1.20	1.00	1.20	$ 1.42	$ 7,962.50
		Removal of Existing Bridge	1	147.00	3.000	441	-	$ 101.25	1.00	1.00	1.00	1.20	1.00	1.20	$ 121.50	$ 53,581.50
8	Widening of SB I-95 over Hallandale Beach Blvd	Florida I-Beam Widening	4	244.00	13.738	3,352	-	$ 225.00	1.00	1.00	1.00	1.20	1.00	1.20	$ 270.00	$ 905,051.25
		Approach Slabs - Concrete	2	20.00	12.318	493	18.25	$ 450.00	1.00	1.00	1.00	1.20	1.00	1.20	$ 540.00	$ 9,854.17
		Approach Slabs - Reinf. Steel	2	20.00	12.318	493	3,649.69	$ 1.18	1.00	1.00	1.00	1.20	1.00	1.20	$ 1.42	$ 5,173.44
		Removal of Existing Bridge	1	244.00	3.000	732	-	$ 101.25	1.00	1.00	1.00	1.20	1.00	1.00	$ 101.25	$ 74,115.00

[1] - Cost is per CY for approach slab concrete and per LB for approach slab reinforcing steel.

[2] - Column applies to approach slab items only.

Bridge No.	Description	Total Estimated Cost
1	SB CD from Pembroke Road to I-95 over Hallandale Beach Blvd	$60,523,286
2	NB CD from NB I-95 to Pembroke Road over NB OnRamp From Hallandale Beach Blvd	$25,164,285
3	SB CD from Hollywood Blvd to Pembroke Road	$9,710,944
4	SB CD from I-95 SB to Pembroke Road over SB OnRamp from Hollywood Blvd	$4,540,339
5	SB CD from I-95 SB to Pembroke Road over SB OnRamp from Hollywood Blvd	$1,793,424
6	NB CD from Pembroke Road I-95 NB over Hollywood Blvd	$1,793,424
7	NB I-95 over Johnson Street	$829,167
8	SB I-95 over Hallandale Beach Blvd	$994,194
Total		**$105,349,062**

Base Cost Adjustment			
Component	Unit	Base Cost	Adj. Base
Steel Plate Girder	SF	$330.00	$371.25
Pile Supported Slab	SF	$300.00	$337.50
Conc. FIB96	SF	$270.00	$303.75
Conc. FIB	SF	$200.00	$225.00
Demo.	SF	$90.00	$101.25
App. Slab - Conc	CY	$400.00	$450.00
App. Slab - Steel	LBS	$1.05	$1.18
Steel Plate Widening	SF	$200.00	$225.00
Steel Plate Extra Substructure	SF	$450.00	$506.25

Base costs have been increased by 12.5% to represent 3% inflation rate over 4 years.

Base cost represents most current cost data from recent bid prices on similar projects in the general project area along I-95.

Cost Factors	
Curvature	1.15
Straddle Pier	1.05
Over Traffic	1.03
Phased Construction	1.2