VENETIAN CAUSEWAY
(Venetian Way)
Project Development & Environment (PD&E) Study
FROM NORTH BAYSHORE DRIVE TO PURDY AVENUE

FM No. 422713-2-22-01

Efficient Transportation Decision Making (ETDM): 12756

Alternatives Public Workshop

May 13, 2015

Florida Department of Transportation - District 6

Project Team

PROJECT MANAGER
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U.S. Department of Transportation
Federal Highway Administration

Agenda

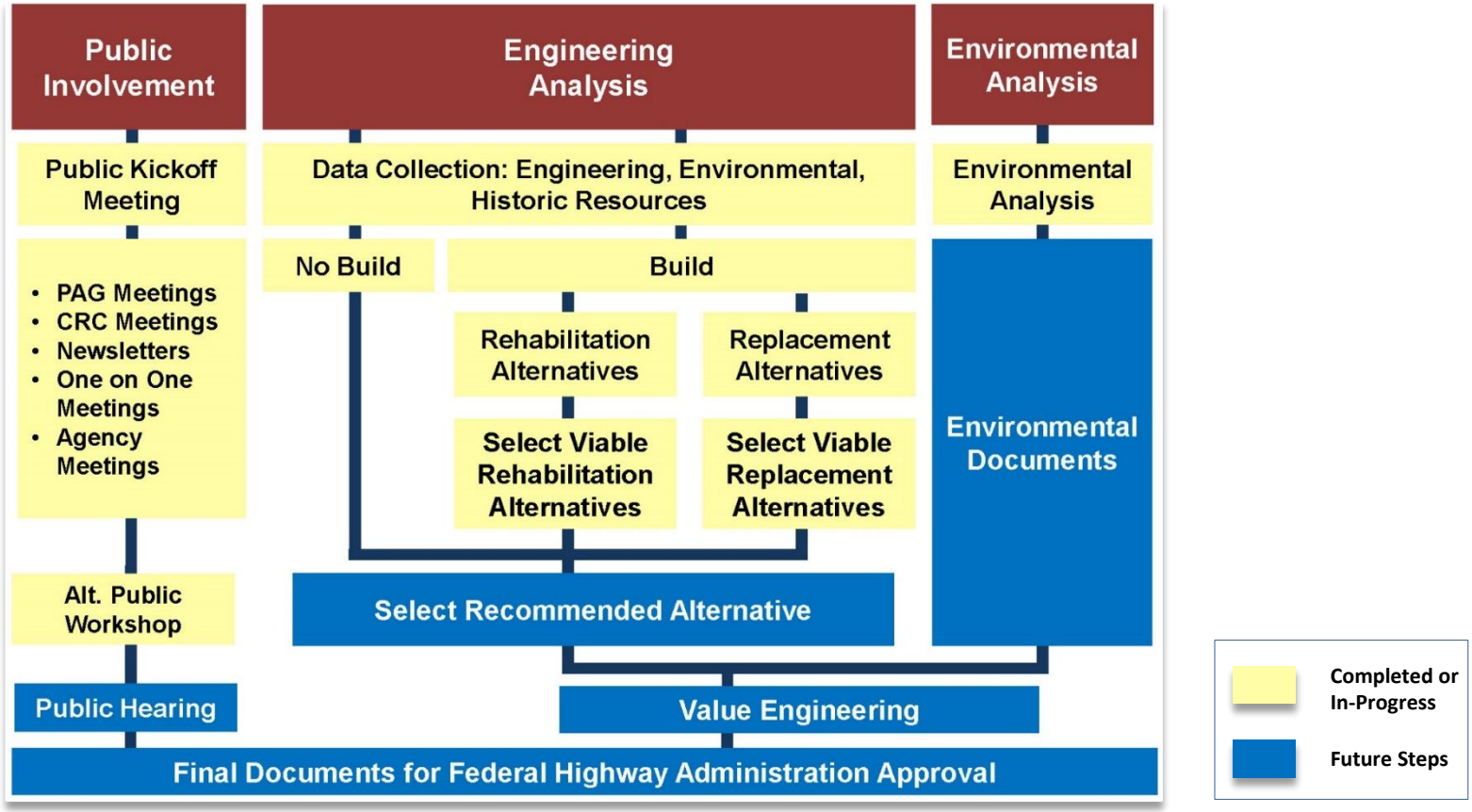
Purpose and Need for Project

The purpose of the proposed project is to address identified structural and functional deficiencies of the twelve existing bridges (ten low-level fixed spans and two movable bascules), through potential alternatives such as replacement or rehabilitation.

- **Purpose of Alternatives Public Workshop (APW)**
- **Study Parameters**
- **Alternatives Matrix and Flowchart**
- **No-Build Alternatives**
- **Build Alternatives**
- **Other Considerations**
- **Evaluation Matrix**
- **Summary**

Purpose of Alternatives Public Workshop (APW)

The purpose of the APW is to get feedback on the alternatives being considered for possible improvements to the Venetian Causeway. The feedback will be used to determine the viable alternatives and select the recommended alternative.



Study Parameters

Structural and Functional Deficiencies

The purpose of the proposed project is to address identified structural and functional deficiencies of the twelve existing bridges (ten low-level fixed spans and two movable bascules), through potential alternatives such as replacement or rehabilitation.

Bridge No.	DOT Bridge #	NBI Condition Rating			Appraisal /Present Posted	Scour/Storm Evaluation		Bridge
		Sufficiency Rating		Deficiency FO/SD		Scour Depth		Exist Est. pile
		2011	*2014**	*2011/2015*	*2014*	*Year 1998*		*1927 and Renovation*
						100 Year	Category 5	
1	874459	32.6	19	SD	5 Tons	26.9 ft	26.9 ft	40-54 ft
2	874460	52	45.9	FO	11 Tons	19.6 ft	29.1 ft	23-25 ft**
3	874461	55.5	46	FO	11 Tons	25.0 ft	31 ft	20-28 ft
4	874463	55.5	46	FO	11 Tons	25.0 ft	31 ft	20-28 ft
5	874465	47.9	36.5	FO	11 Tons	19.6 ft	25.9 ft	20-28 ft
6	874466	57.6	48.2	FO	11 Tons	22.6 ft	28.2 ft	20-28 ft
7	874471	55.5	46	FO	11 Tons	22.0 ft	27.3 ft	20-28 ft
8	874472	55.5	46	FO	11 Tons	22.6 ft	28.9 ft	20-28 ft
9	874473	64	48.7	FO	11 Tons	24.2 ft	35.5 ft	22-27 ft**
10	874474	57.5	32.1	FO	11 Tons	25.0 ft	30.1 ft	20-28 ft
11	874477	64	41	FO	11 Tons	25.3 ft	31.6 ft	20-28 ft
12	874481	68.1	40.4	FO	16 Tons	15.8 ft	19.4 ft	27-28 ft**

FO= Functionally Obsolete

SD= Structural Deficient

EST.= Estimated

*** Based on FDOT Bridge Information, April 1st 2015**

**** Based on March 2015 Geotechnical Investigation (Parallel Seismic) tests**

Study Parameters

Historic Resource-Venetian Causeway

- Constructed in 1926
- Oldest causeway in Florida
- Listed on the National Register of Historic Places (NRHP)
- Listed as Historic in the Cities of Miami and Miami Beach

Section 106 of National Historic Preservation Act

Cultural Resources Assessment Survey

- Establish Area of Potential Effect
- Identify and Document Resources
- Evaluate Significance according to NRHP Criteria

Evaluation of Effects --Determination of Effects Case Study
Apply Section 106 Criteria of Effects

All Alternatives assessed in terms of their effects to resources

- Rehabilitation, if according to the Secretary of Interiors Standards – typically results in No Adverse Effect – but depends on extent of Rehabilitation.
- Replacement Will be Adverse Effect

Finding of No Adverse Effect- Processes Concluded
Finding of Adverse Effect - Develop MOA and Section 4(f) Programmatic or Individual Statement Documentation to document there is no prudent or feasible alternative to the proposed improvements

Section 106/4(f) Processes Required for Historic Structures

Excerpts from FDOT PD&E Manual (Part 2, Chapter 13)
13-2.4.2 Programmatic Section 4(f) Evaluations

Under a Programmatic Section 4(f) Evaluation, certain conditions are laid out such that, if a project meets the conditions, it will satisfy the requirements of Section 4(f) that there **are no feasible and prudent alternatives and that there has been all possible planning to minimize harm.**

Alternatives and Findings

- **Do Nothing.** The do nothing alternative has been studied and **is not feasible and prudent** because it does not correct the situation that causes the bridge to be considered structurally deficient and functionally obsolete to the degree where the bridge poses serious and unacceptable safety hazards to the public or places intolerable restriction on transport or travel.

Processes Required for Historic Structures – Cont'd

- Build a new structure at a different location without affecting the historic integrity of the old bridge, as determined by procedures implementing the National Historic Preservation Act (NHPA). Demonstrate that investigations have been conducted to construct a bridge on a new location or parallel to the old bridge, **but this alternative is not feasible and prudent.**

- Rehabilitate the historic bridge without affecting the historic integrity of the structure, as determined by procedures implementing the NHPA. Show that studies have been conducted of the rehabilitation measures, but because the bridge is so structurally or geometrically deficient, it cannot be rehabilitated to meet either the minimum acceptable load requirements or the minimum required capacity of the highway system on which it is located without affecting the historic integrity of the bridge.

Processes Required for Historic Structures – Cont'd

Measures to Minimize Harm

For bridges that are to be rehabilitated according to the Secretary of the Interiors Standards, the historic integrity of the bridge is preserved, to the greatest extent possible, consistent with unavoidable transportation needs, safety, and load requirements.

For bridges that are to be rehabilitated to the point that the historic integrity is adversely affected or that are to be moved or demolished, the FHWA ensures that, in accordance with the Historic American Engineering Record (HAER) standards, or other suitable means developed through consultation, fully adequate records are made of the bridge. In addition, other mitigation measures will be developed in consultation with the appropriate agencies, such as SHPO, USCG, as well as the Cities, County, residents, and locally affected parties.

Study Parameters

Hurricane Resistance

- **Low Causeway Bridges**
  - Below Anticipated Storm Surge
    - 100 Year Storm Surge – Elevation 8 ft to 12 ft
    - Wave Crests – 7 to 8 ft above Storm Surge

I-I0 Escambia Bay, FL. - Hurricane Ivan - 2005

Study Parameters

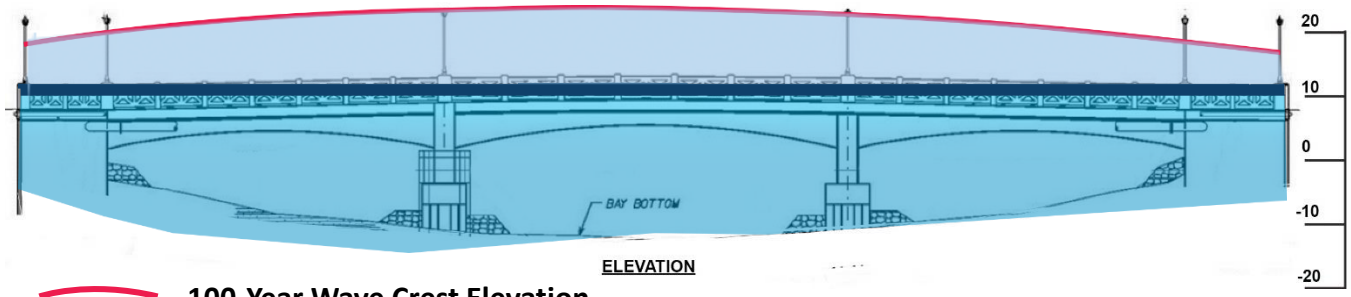
Hurricane Resistance

100 year Peak Storm Surge Heights

- 7.7' (FEMA) to 11.6' (Current Study)
- Wave crest is storm surge plus 70% of the maximum wave height. Causeway bridges are mostly below this elevation.

Wave Forces

- Vertical will be in the 10 to 14 kip/ft range or 500 to 700 kips (250 to 350 tons) per 50 ft span!
- Horizontal wave forces will be in the 4 to 6 kip/ft range or 200 to 250 kips (100 to 125 tons) per 50 ft span! (Equivalent to a collision with a barge drifting at approximately half a knot)



Location	Design Wave Height (ft)	Wave Crest Elevation (ft-NAVD)
End Bent 1	9.3	18.1
Pier 2	13.7	21.2
Pier 3	12.9	20.6
End Bent 4	7.5	16.8

100-Year Water Surface Elevation (storm surge) and the 100-Year Wave Crest Elevations.

Study Parameters

Vessel Collision Resistance

- All Causeway Bridges must consider Risk of Vessel Collision
- West Bascule Bridge – over Intracoastal Waterway
  - 80 Tug & Barges per Year (each direction)
  - 500 to 600 Other Larger Vessels (each direction)
- East Bascule Bridge – over Tide Relief Channel
  - Mostly Recreational and Smaller Commercial Craft Only

Rehabilitation Parameters

- **Meet current safety standards**
- **Maintain National Register of Historic Places listing**
- **Minimize environmental impacts**
- **Rehabilitation *Service Life – 25 years**
- **Typical Section – improve functionality**
- **Structural Capacity – meet current standards for:**
  - Load carrying capacity
  - Foundation stability
  - Hurricane resistance
  - Vessel collision resistance
- **Bridge Railings and End Treatments**
  - Preserve historic character
  - Meet current standards
- **At a minimum, maintain the existing bridge clearances**
- **Maintain traffic during construction**
- **Maintain utility services during construction**

**** Cathodic Protection will be utilized to decrease future corrosion***

Rehabilitation Parameters

Cathodic Protection (CP)

- With respect to corrosion of reinforcing steel in the concrete at the Venetian Causeway Bridges, CP is the only option available to extend the service life of the bridges another 25 years without constantly having extensive concrete repair work performed.

- CP is an electrochemical method of corrosion protection that takes advantage of the electrochemical nature of corrosion by transforming a metal into a non-corroding cathode.

- CP is the only proven technique to stop corrosion of reinforcing steel in concrete.

Build Alternatives

Replacement Parameters

- Meet current standards and loading requirements
- Minimize environmental impacts
- Service Life – 75 years
- Bridge Railings maintain or improve views of the water
- Seek opportunities to improve the existing bridge clearances. Variances may be required.
- Maintain traffic during construction
- Maintain utility services during construction
- Accommodate high pedestrian and bicycle traffic

	Pedestrians	Bicycles
8-hour volume	375	679
Peak hour volume	90	208
Average hourly volume	47	85

Alternatives Matrix / Ranking Ballot

Name: Joe Sample
Address: 1234 Venetian Way, Miami, FL, 33139
Phone No.: (305) 765-4321
Email Address: jsample@email.com

Ranking Ballot

APW # 1

1. Select either No-Build, Rehabilitation or Replacement in the Option column by circling the option. **Select one option only.**
2. Rank the alternatives within the option you selected. Assign a "1" to the top ranked alternative for the selected option, "2" your second ranked alternative, etc.
3. Rank the Maintenance of Traffic Options, with "1" being the most preferred.
4. Please hand in the Ranking Ballot at the Alternatives Public Workshop, e-mail to Dat.Huynh@dot.state.fl.us by 5/20/2015 or mail (post marked by 5/20/2015) to: Dat Huynh, P.E., Florida Department of Transportation – District 6; Adam Leigh Cann Building 1000 NW 111 Avenue, Room 6251 Miami, Florida 33172

Option	Alternative	Description	Ranking
No-Build Alternative	1	Do Nothing	1
	2	Transportation System Management	2
Rehabilitation Alternatives			
Build Alternatives *Rehabilitation*	3	Fixed Bridge Rehab w/out Beam Strengthening	
	4	Fixed Bridge Rehab with Beam Strengthening	
	M1	Bascule Bridge Rehabilitation	
Replacement Alternatives			
Build Alternatives *Replacement*	**Typical Section Alternatives**		
	T1	Venetian Railing	
	T2	Wyoming Railing TL-4 at coping	
	T3	Wyoming Railing TL-3 at curb and Original Venetian Railing at Coping	
	T4	Wyoming Railing TL-3 at curb and Custom Railing at Coping	
	Fixed Alternatives		
	5	Tunnel	
	6	High Level Fixed Bridge	
	7	Arched Beams	
	8	FIB With Arched Fascia	
	9	FIB	
	10	Cast-in-Place Slab (Flat/Variable Depth)	
	Movable Bridge Alternatives		
	M2	Swing Bridge	
	M3	Vertical Lift Bridge	
	M4	Double Leaf Bascule Bridge	
	M5	Single Leaf Bascule Bridge	
Maintenance of Traffic			
	Option 1	Detours	
	Option 2	Phased Construction With Detour at East Bridge	
	Option 3	Phased Construction With Temporary Bridge at East Bascule	

Alternatives Matrix / Ranking Ballot

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Ranking Ballot

APW # 2

1. Select either No-Build, Rehabilitation or Replacement in the Option column by circling the option. **Select one option only.**
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	M1	Bascule Bridge Rehabilitation	
Replacement Alternatives			
Build Alternatives *Replacement*	**Typical Section Alternatives**		
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	Fixed Alternatives		
	5	Tunnel	
	6	High Level Fixed Bridge	
	7	Arched Beams	
	8	FIB With Arched Fascia	
	9	FIB	
	10	Cast-in-Place Slab (Flat/Variable Depth)	
	Movable Bridge Alternatives		
	M2	Swing Bridge	
	M3	Vertical Lift Bridge	
	M4	Double Leaf Bascule Bridge	
	M5	Single Leaf Bascule Bridge	
Maintenance of Traffic			
	Option 1	Detours	1
	Option 2	Phased Construction With Detour at East Bridge	
	Option 3	Phased Construction With Temporary Bridge at East Bascule	

Alternatives Matrix / Ranking Ballot

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Ranking Ballot

APW # 3

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Option	Alternative	Description	Ranking
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Build Alternatives *Replacement*	**Typical Section Alternatives**		
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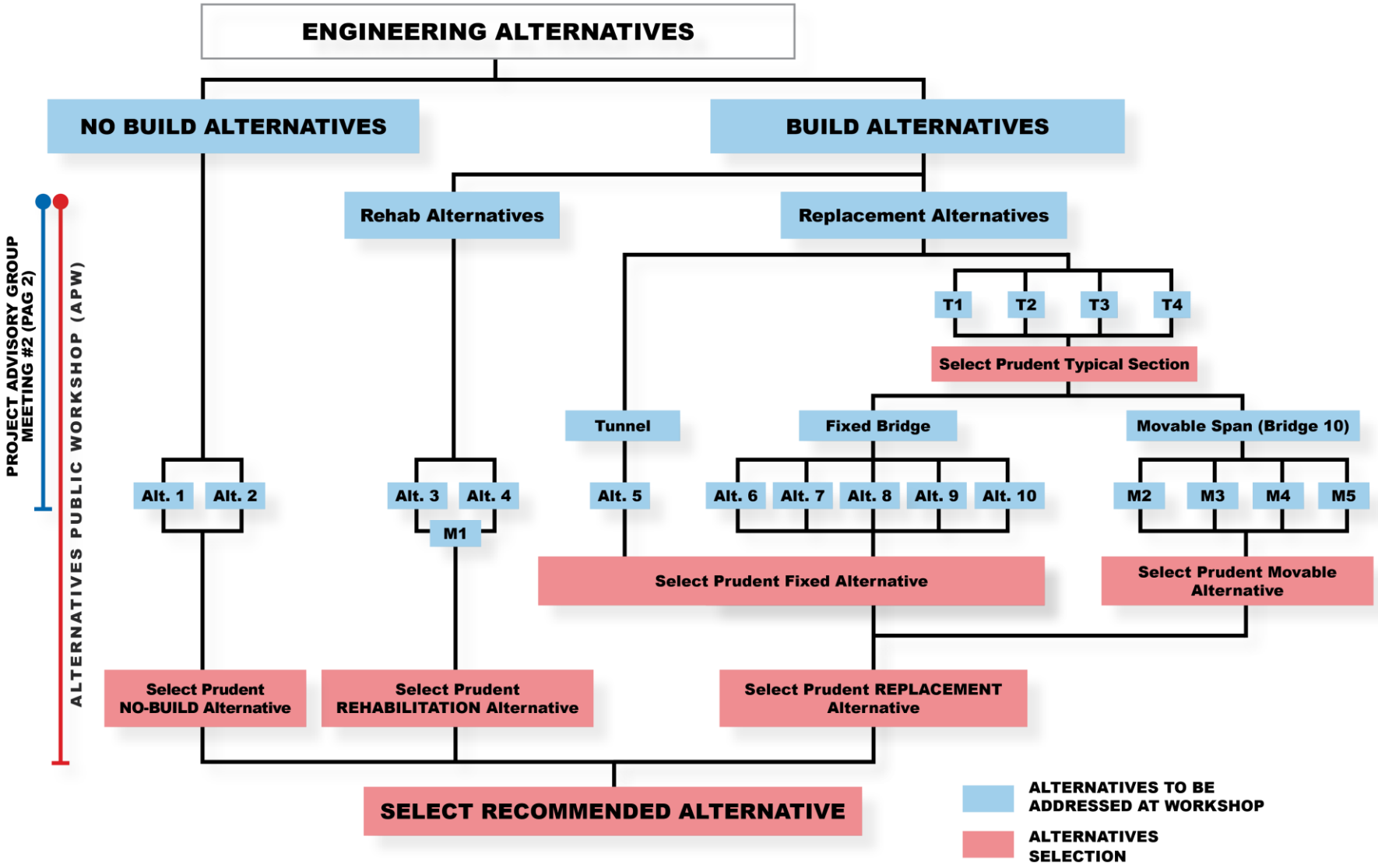
	T4	Wyoming Railing TL-3 at curb and Custom Railing at Coping	4
	Fixed Alternatives		
	5	Tunnel	1
	6	High Level Fixed Bridge	2
	7	Arched Beams	3
	8	FIB With Arched Fascia	4
	9	FIB	5
	10	Cast-in-Place Slab (Flat/Variable Depth)	6
	Movable Bridge Alternatives		
	M2	Swing Bridge	1
	M3	Vertical Lift Bridge	2
	M4	Double Leaf Bascule Bridge	3
	M5	Single Leaf Bascule Bridge	4
Maintenance of Traffic			
	Option 1	Detours	1
	Option 2	Phased Construction With Detour at East Bridge	2
	Option 3	Phased Construction With Temporary Bridge at East Bascule	3

Alternatives Flowchart



No-Build Alternatives

Alt. 1

Alt. 1 - Do Nothing

- Existing Deficiencies will Remain
- Continued Deterioration
- Extensive Periodic Repairs and Maintenance

Does not meet purpose and need for project

No-Build Alternative

Alt. 2 – Transportation System Management

Alt. 2

- Enhanced Bus service
- Facilitate Pedestrians and Bicyclists
- Existing Deficiencies will remain, but safe bridges required for effective TSM

Does not meet purpose and need for project

Alternative Corridor

Corridor Analysis

FDOT PD&E Manual (Part 2, Chapter 13) - Build a new structure at a different location without affecting the historic integrity of the old bridge, as determined by procedures implementing the National Historic Preservation Act (NHPA). Demonstrate that investigations have been conducted to construct a bridge on a new location or parallel to the old bridge (allowing for a one-way couplet), but, for one of the following reasons, this alternative is **not feasible and prudent:**

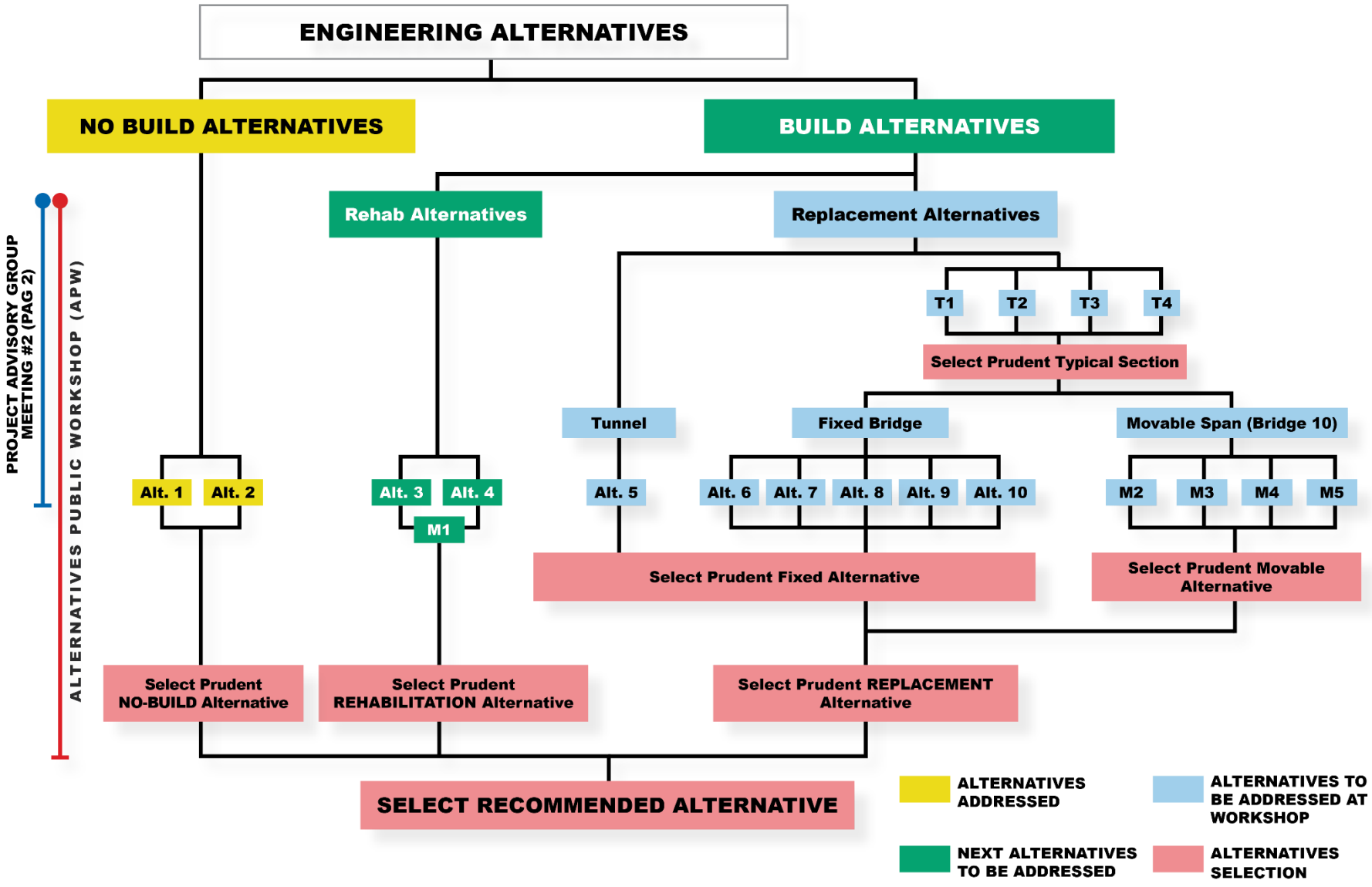
1) Terrain - the existing bridge has already been located at the only feasible and prudent site,
2) building a new bridge away from the present site would result in social, economic, or environmental impact of extraordinary magnitude,
3) the new site would **not be feasible and prudent** where cost and engineering difficulties reach extraordinary magnitude, and
4) **It would not be feasible and prudent** to preserve the existing bridge, even if a new bridge were to be built at a new location.

No-Build Alternatives

Alternative Corridor – Cont'd

Does not meet purpose and need for project

Summary and Next Steps



Rehabilitation Alternatives

Existing Bridge Pile Length and Concrete Core Compressive Strength Test Results*

Bridge No.	Pier/Bent Location	Test Location	Estimated Pile Length (Ft.) **	Est. Pile Tip Elevation (Ft.) #	Concrete Core Compression Strength Test (PSI)
#2 (874460)	Int. Pier 2	SBR-2-1	23.6	-17.65	-
	Int. Pier 3	SBR-2-2	23.2	-16.95	5399 ▲
#9 (874473)	Int. Pier 2	SBR-9-1	22.6	-16.9	4235 ▲
	Int. Pier 3	SBR-9-2	26.6	-20.3	-
#12 (874481)	Int. Pier 2	SBR-12-1	28	-21.8	-
	Int. Pier 3	SBR-12-2	26.7	-20.9	4016 ▲

*** Test Pile Length performed by Parallel Seismic Method, concrete core performed per ASTM Test Designation C-42**

**** Estimated pile lengths are from top of foundation to toe of pile.**

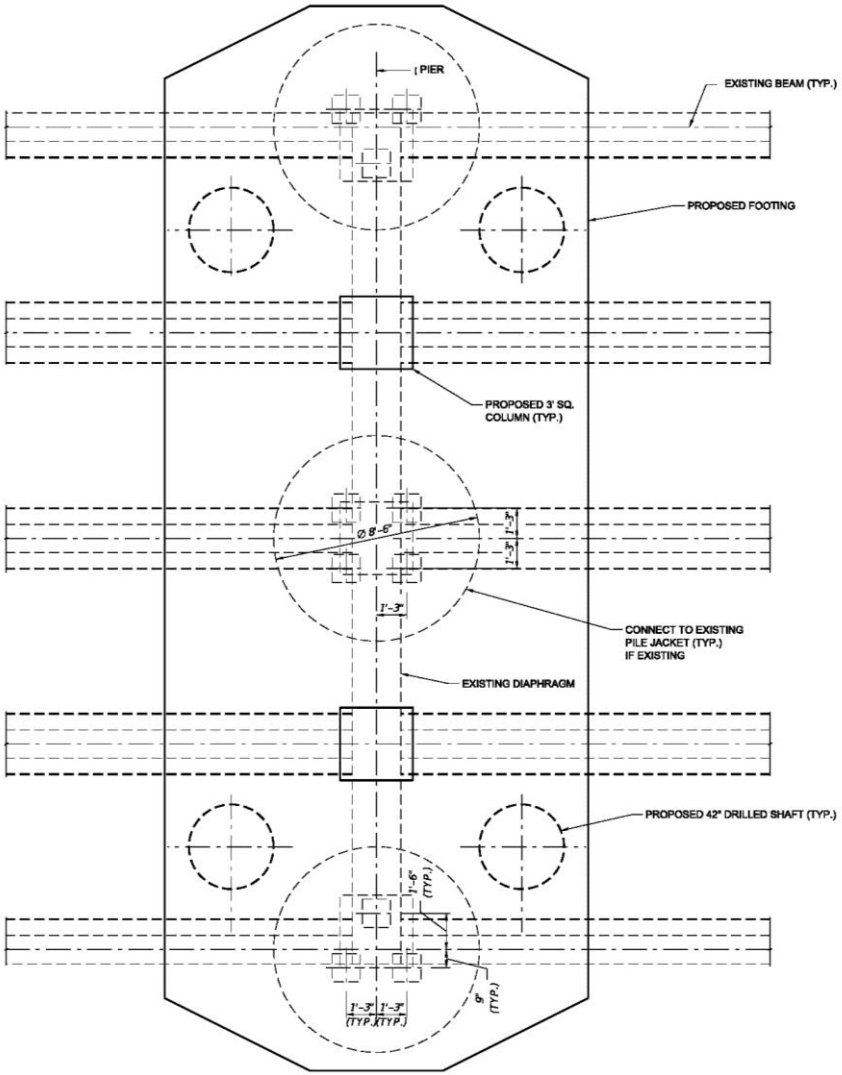
 # Vertical Datum: NAVD 1988.

▲ Bridge Load Rating Analysis: Performed assuming 3000 psi, concrete compressive strength (higher than specified 2500 psi, bridges built prior to 1959 per FDOT load rating manual, section 6.A.5.2.1). Above test values confirms assumed values.

Rehabilitation Alternatives

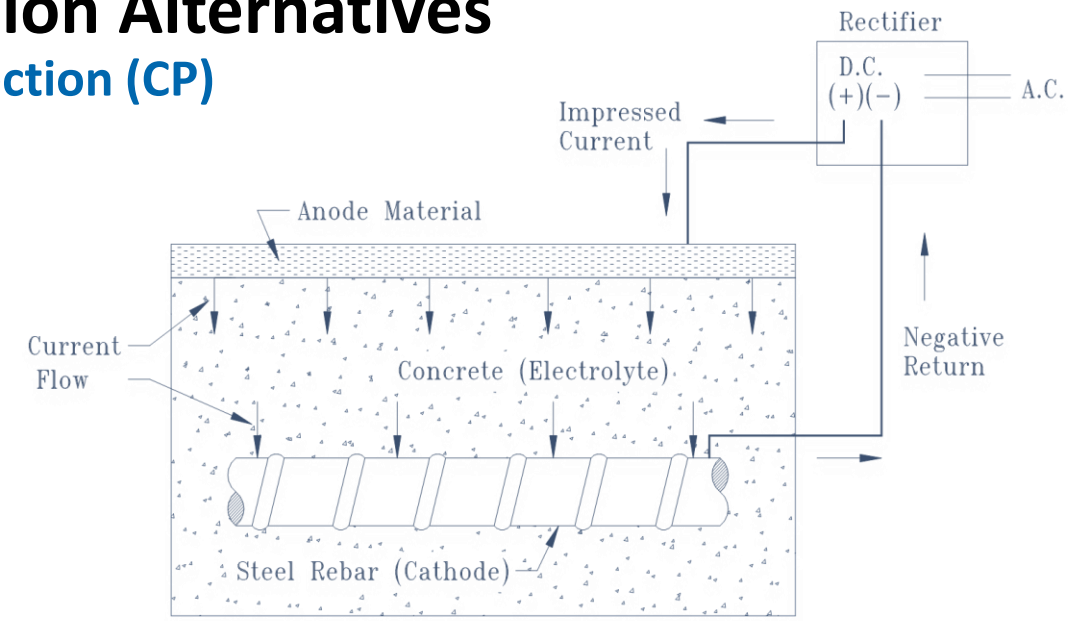
Alt. 3 & 4 –Foundation Strengthening

- Repair concrete spalls and cracks
- Extend Service Life
- Cathodic protection
- Footing Encasement
- Pier Strengthening for wave vulnerability
- Riprap placement at foundations for scour protection



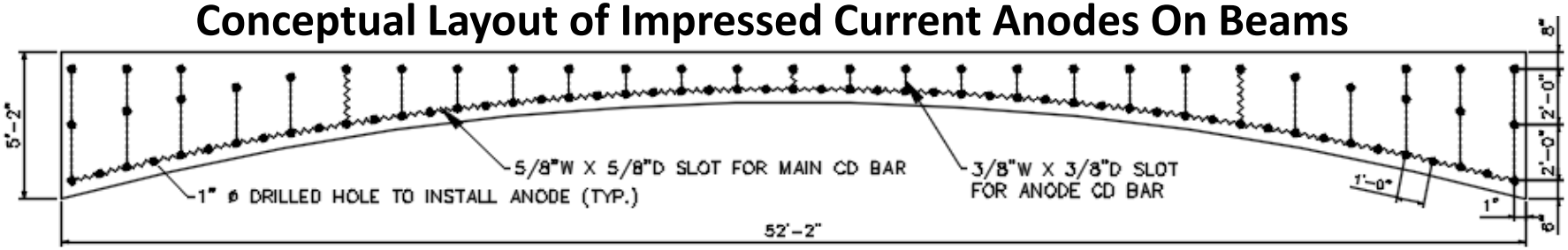
Rehabilitation Alternatives

Cathodic Protection (CP)



- A relatively unique impressed current CP system will be needed for the beams and diaphragms and a standard galvanic CP system for the columns.

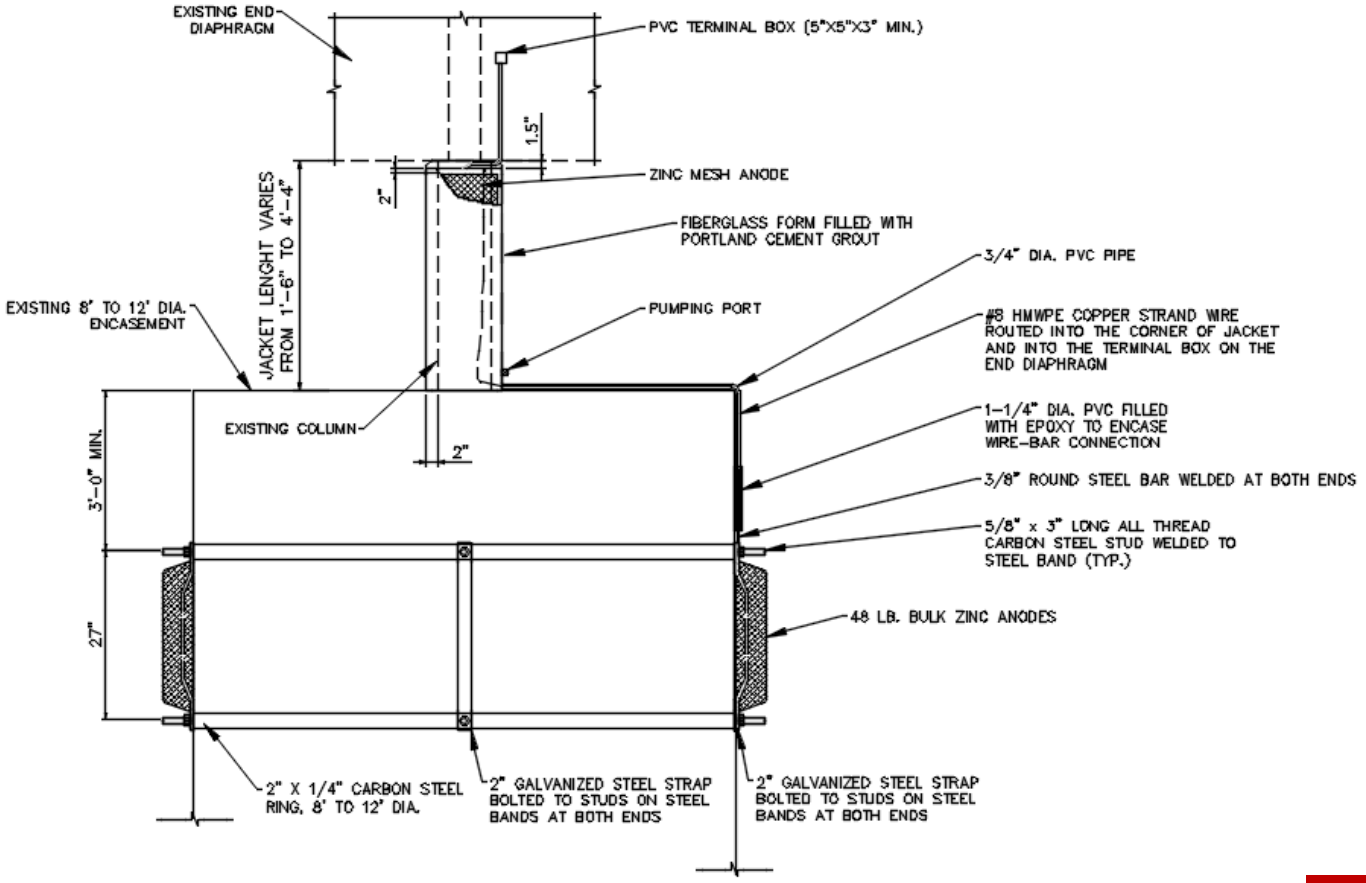
Conceptual Layout of Impressed Current Anodes On Beams



Rehabilitation Alternatives

Cathodic Protection (CP)

Conceptual Design of the Galvanic CP System on Columns



Rehabilitation Alternatives

Cathodic Protection (CP)

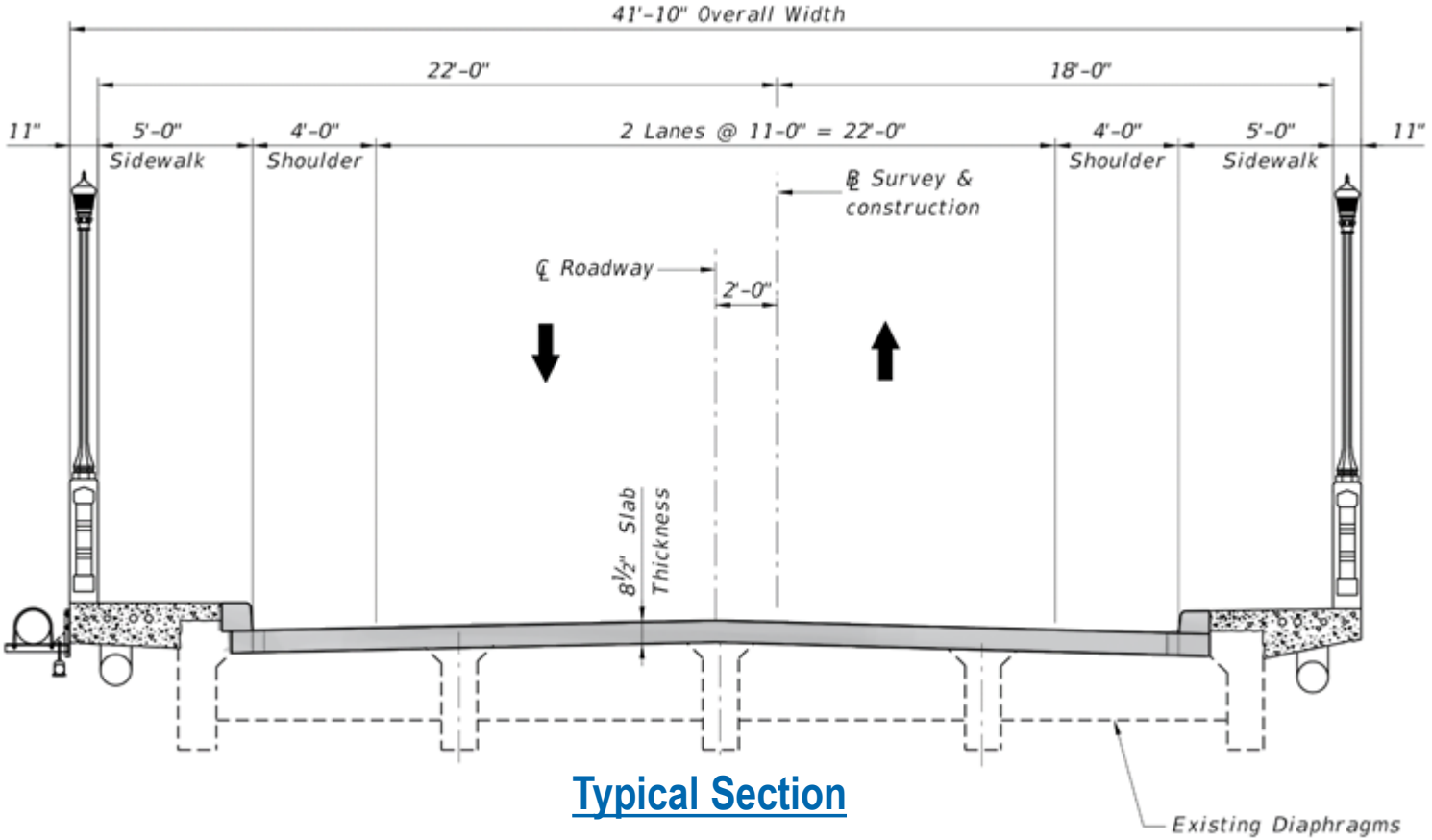
Cathodic Protection Construction Cost Estimate

Item Description	Estimated Cost
Impressed Current Cathodic Protection - Furnish and Install	$8,205,868
Galvanic Cathodic Protection - Furnish and Install	$1,208,630
Contingency (20% of Total Estimated Construction Cost)	$1,882,900
Total Estimated Construction Cost With Contingency	$11,297,398

Rehabilitation Alternatives

Alt. 3

Alt. 3 - Fixed Bridge Rehab w/out Beam Strengthening



Typical Section

- Expand Sidewalk to 5 feet to meet minimum requirement for ADA
- 4 ft Shoulder does not meet 5.5 ft shoulder bike lane requirement

Rehabilitation includes:

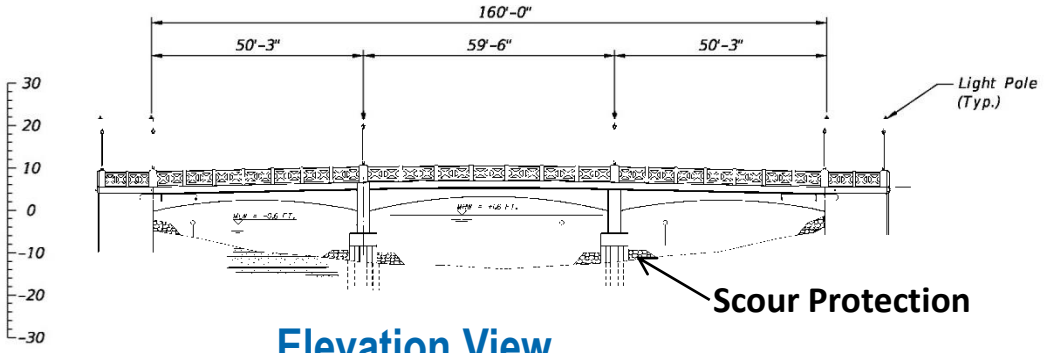
- Deck Replacement and Foundation Strengthening
- 41'-10" Overall width to remain, Venetian Railing to remain

Rehabilitation Alternatives

Alt. 3

Alt. 3 - Fixed Bridge Rehab w/out Beam Strengthening

Plan View



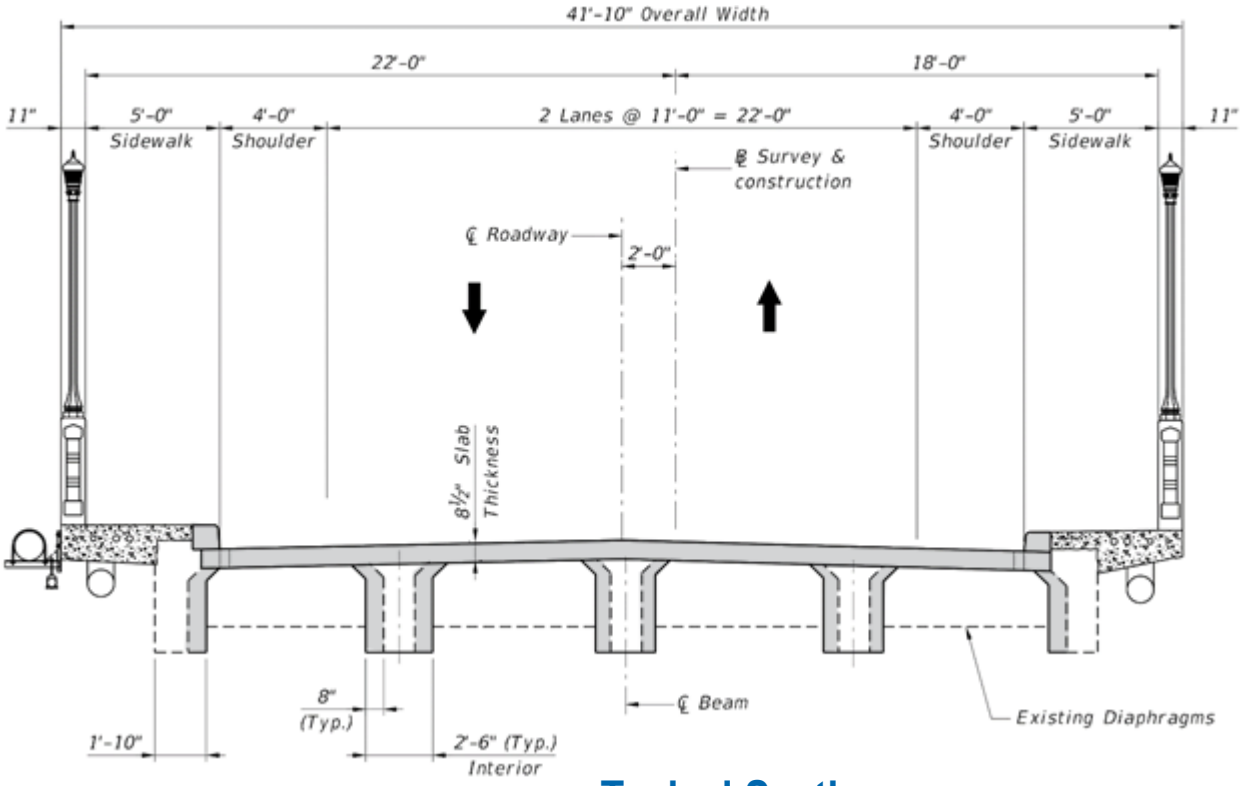
Elevation View

Estimated Cost Range:
$34 - $36 Million

Rehabilitation Alternatives

Alt. 4

Alt. 4 - Fixed Bridge Rehab with Beam Strengthening



Typical Section

- Expand Sidewalk to 5 feet to meet minimum requirement for ADA
- 4 foot Shoulder does not meet 5.5 foot shoulder requirement for bike lane

Rehabilitation includes:

- Deck Replacement Beam and Foundation Strengthening
- 41'-10" Overall width to remain, Venetian Railing to remain

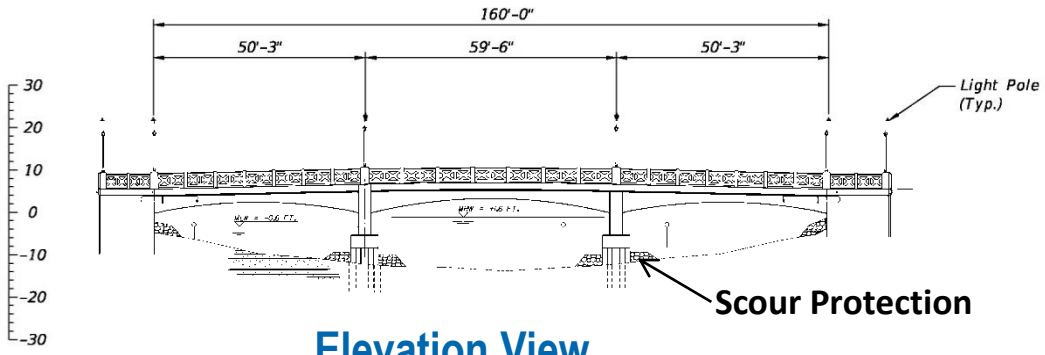
Rehabilitation Alternatives

Alt. 4

Alt. 4 - Fixed Bridge Rehab with Beam Strengthening

Plan View

Estimated Cost Range:
$42 - $44 Million

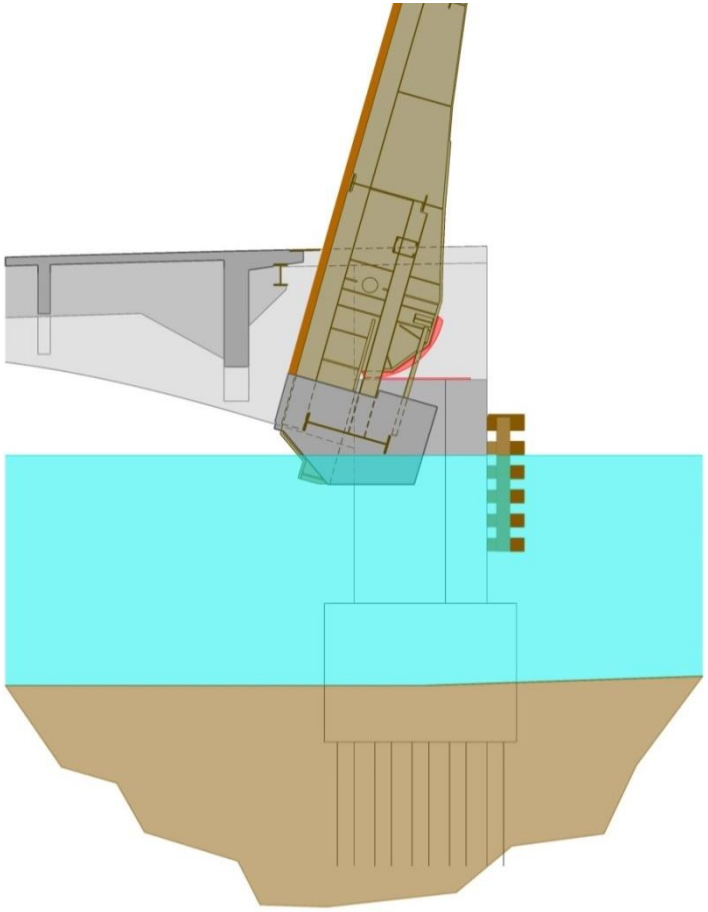


Elevation View

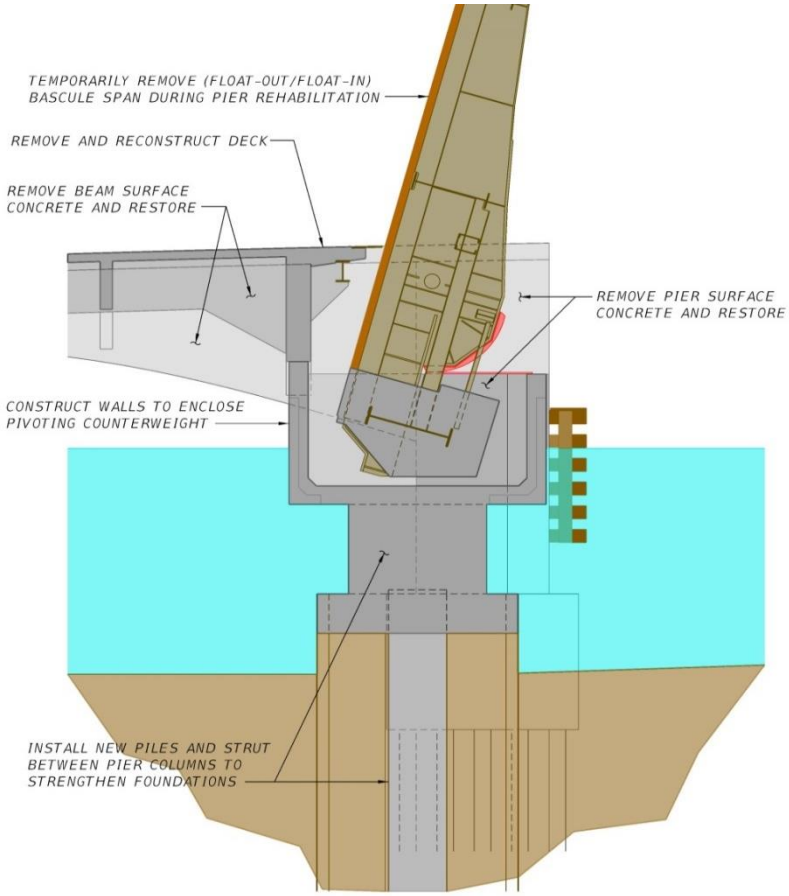
Rehabilitation Alternatives

M1

Alt. M1 - Bascule Bridge Rehabilitation



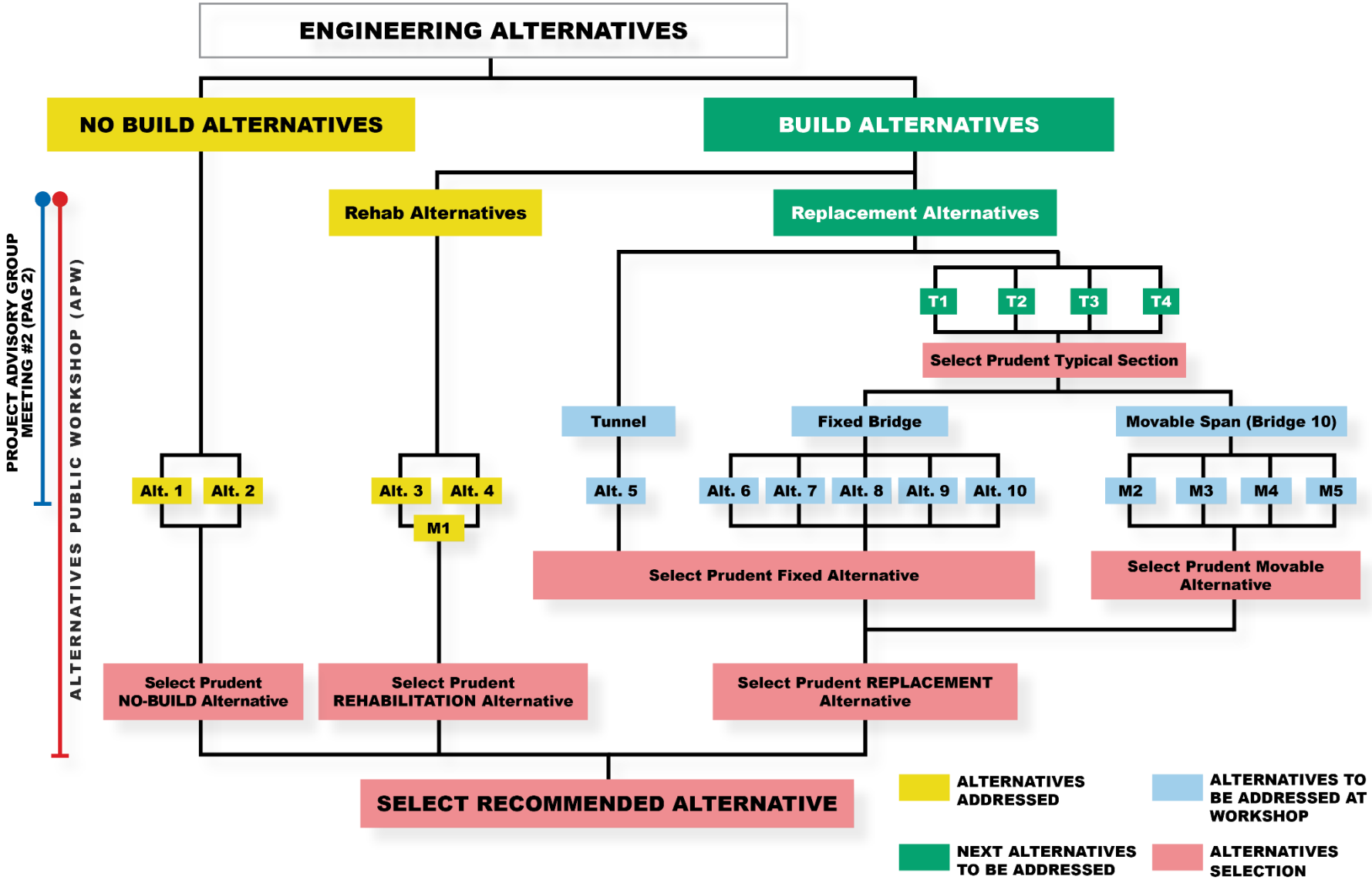
SECTION THRU EXISTING BASCULE SPAN



SECTION THRU REHABILITATED BASCULE SPAN

Estimated Cost Range: $8 - $9 Million

Summary and Next Steps



Replacement Alternatives

Excerpts from FDOT PD&E Manual (Part 2, Chapter 6 - Alternatives)

6.1 Overview

"The alternatives section is the heart of the Environmental Document and should rigorously explore and objectively evaluate alternatives."

6-2.3 Analysis and Documentation

"The alternatives section of the Environmental Document must address the following discussion points in accordance with 40 CFR 1502.14: 1. Rigorously explore and objectively evaluate all reasonable alternatives (for EISs), and, for alternatives which are being eliminated from detailed study, briefly discuss the reasons for their elimination."

Replacement Alternatives – Typical Section/ Railing Selection

T1

T1 – Venetian Railing

- Functions as Traffic Barrier and Pedestrian Railing
- Matches Current Railings on Causeway but with addition of Inserts in Openings

Replacement Alternatives – Typical Section/ Railing Selection

T1

T1 – Venetian Railing

Replacement Alternatives – Typical Section/ Railing Selection

T2

T2 – Wyoming Railing TL-4 at coping

- Functions as Traffic Barrier and Pedestrian Railing
- Steel Tube Railing with Intermediate Cables

Replacement Alternatives – Typical Section/ Railing Selection

T2

T2 – Wyoming Railing TL-4 at coping

Replacement Alternatives – Typical Section/ Railing Selection

T3

T3 – Wyoming Railing TL-3 at curb and Original Venetian Railing at Coping

- Traffic Barrier at Curb provides Separation from Traffic; Improves Safety and Functionality at Movable Span
- Matches Original Venetian Causeway Railing with larger openings, but with inserts in openings

Replacement Alternatives – Typical Section/ Railing Selection

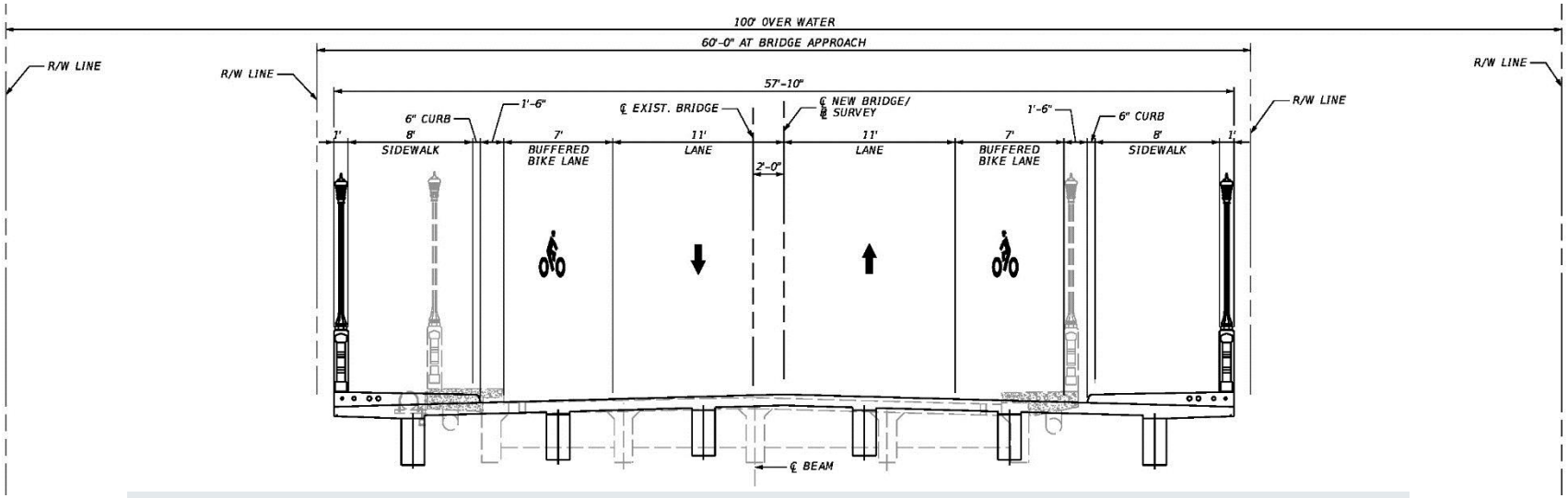
T4

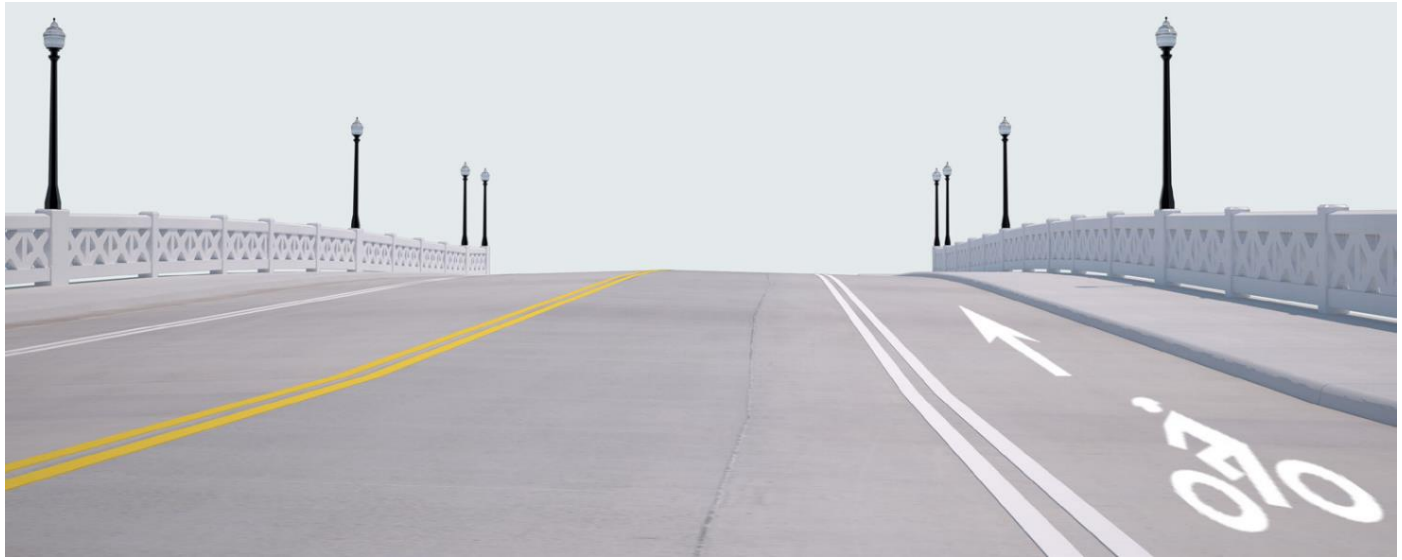
T4 – Wyoming Railing TL-3 at curb and Custom Railing at Coping

- Traffic Barrier at Curb provides Separation from Traffic; Improves Safety and Functionality at Movable Span
- Custom Metal Pedestrian Railing

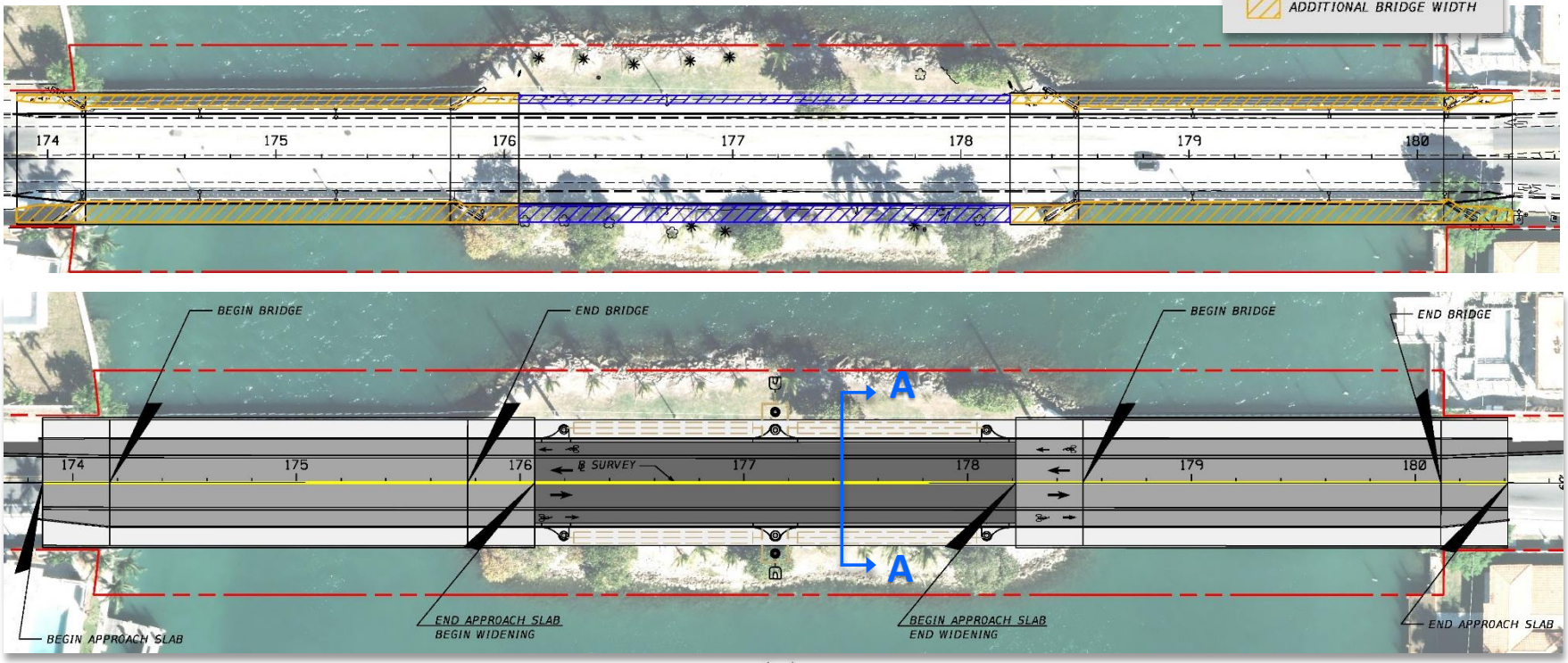
Build Alternatives

Replacement Alternatives – Typical Section Selection

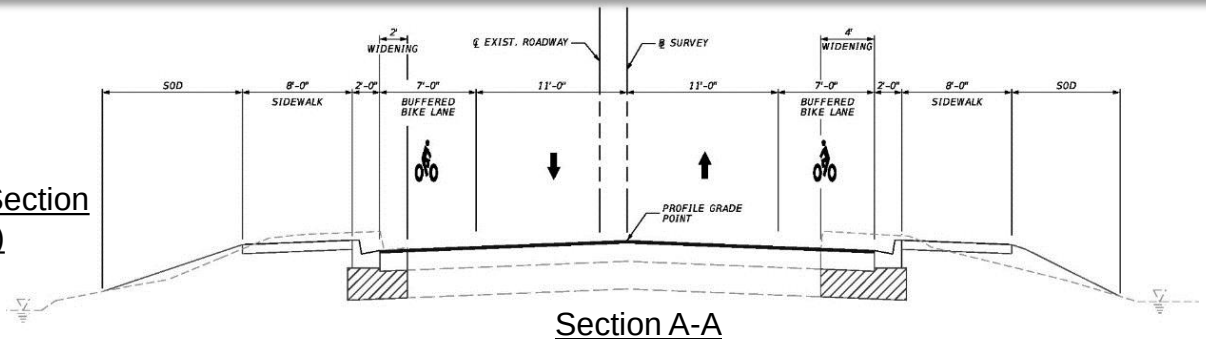




Replacement Alternatives – Fixed Bridges

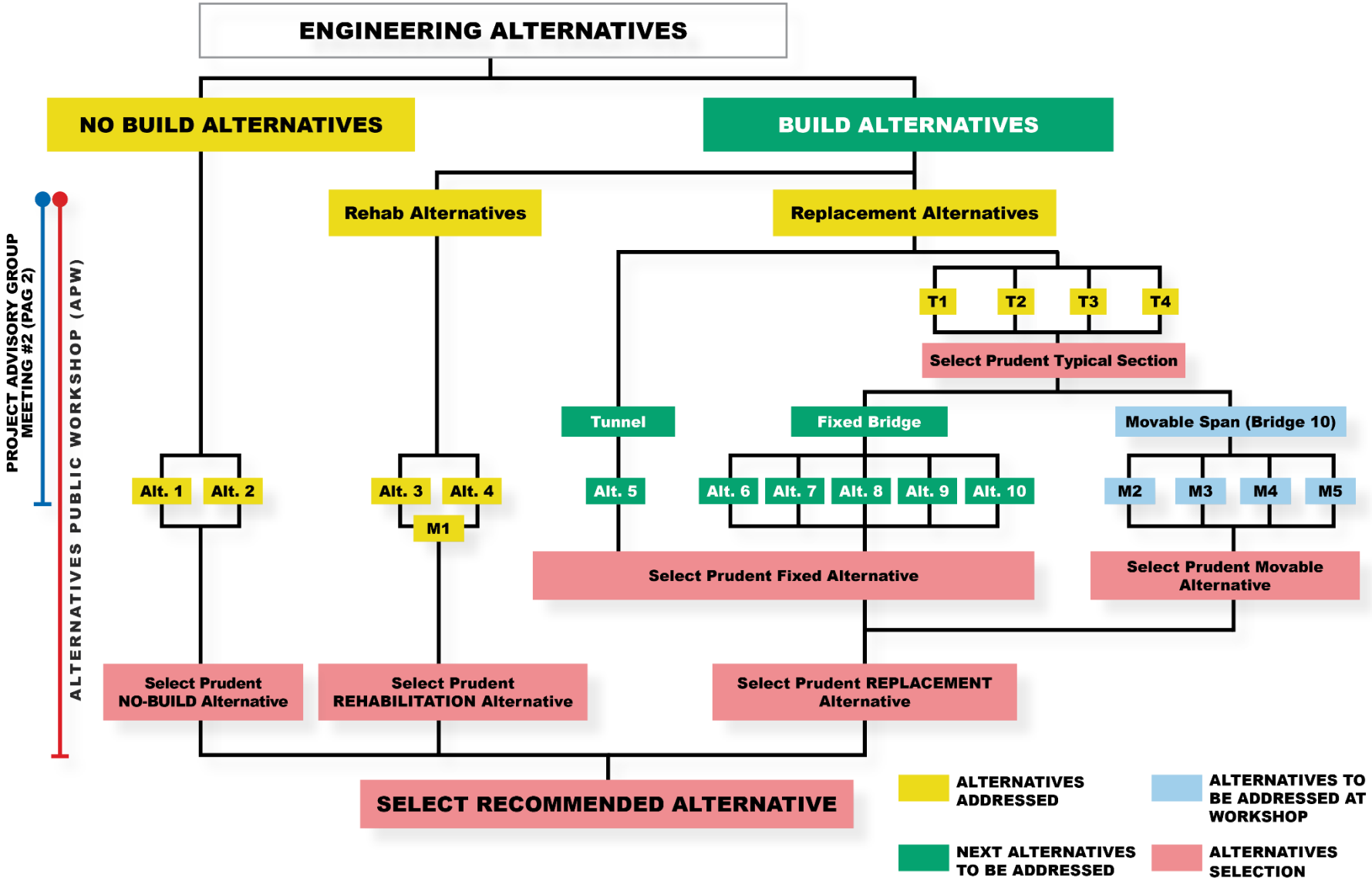


Roadway Typical Section (Spoil Island)



Section A-A

Summary and Next Steps



Replacement Alternatives

Alt. 5

Alt. 5 - Tunnel

PortMiami Tunnel

Tunnel Limits
Portal Limits

Estimated Cost Range: $160- $200 Million

Replacement Alternatives – Fixed Bridges

Alt. 6

Alt. 6 - High Level Bridge

Image: Schener Fotografia

High Level Bridge Limits

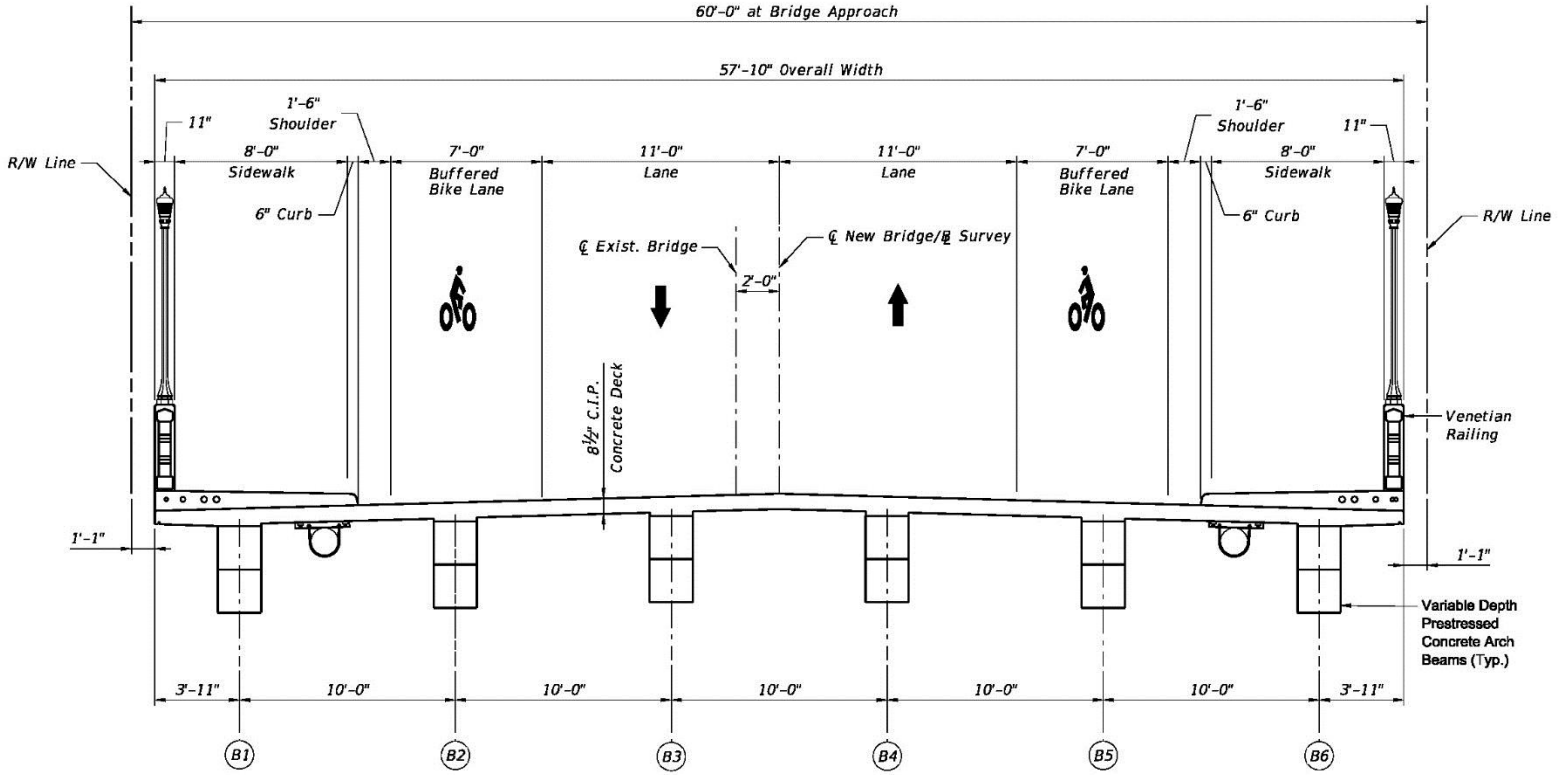
Estimated Cost Range:

$78 - $86 Million

Replacement Alternatives – Fixed Bridges

Alt. 7

Alt. 7 – Arched Beam

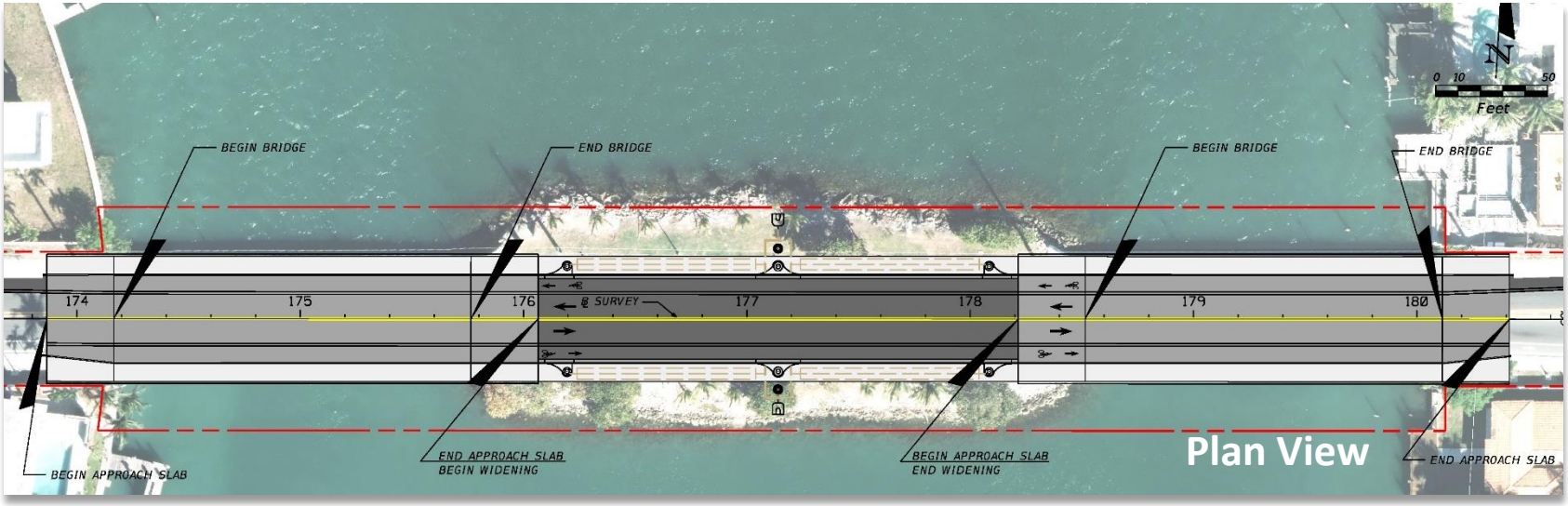


Typical Section

Replacement Alternatives – Fixed Bridges

Alt. 7

Alt. 7 –Arch Beam



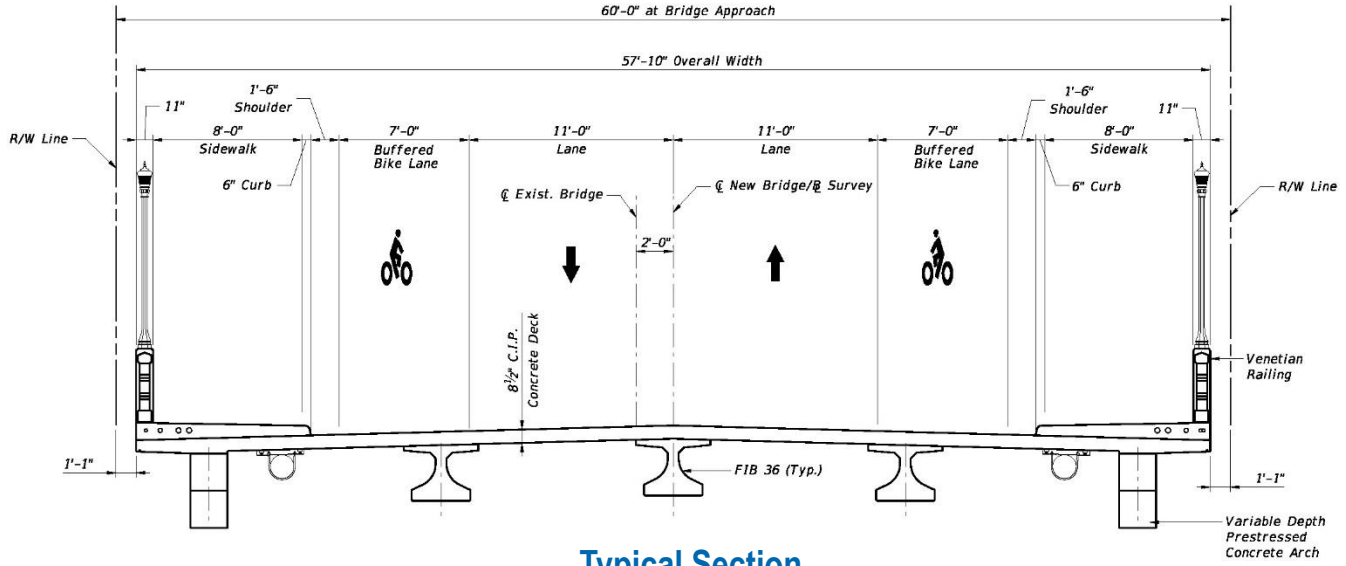
Estimated Cost Range:
$36 - $41 Million*

High Range for Phased Construction

Replacement Alternatives – Fixed Bridges

Alt. 8

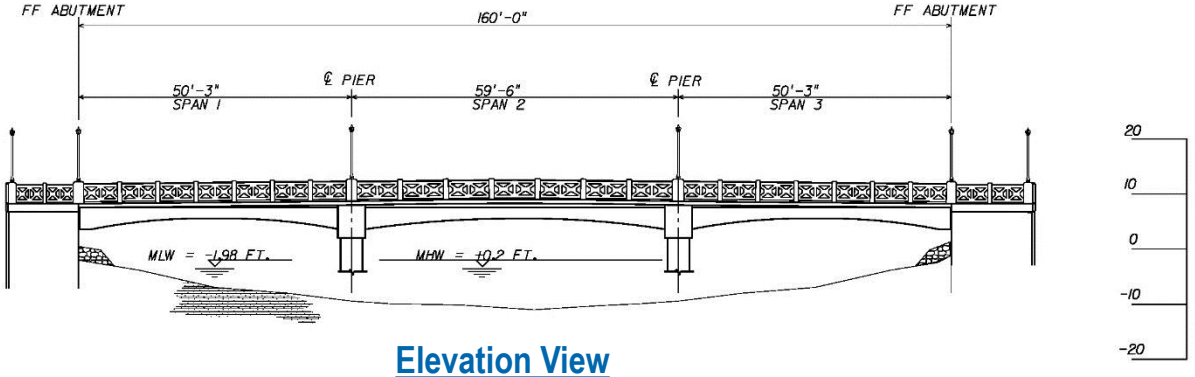
Alt. 8 – FIB with Arched Fascia (FA)



Typical Section

- **Estimated Cost Range:**
  $35 - $40 Million*

  High Range for Phased Construction

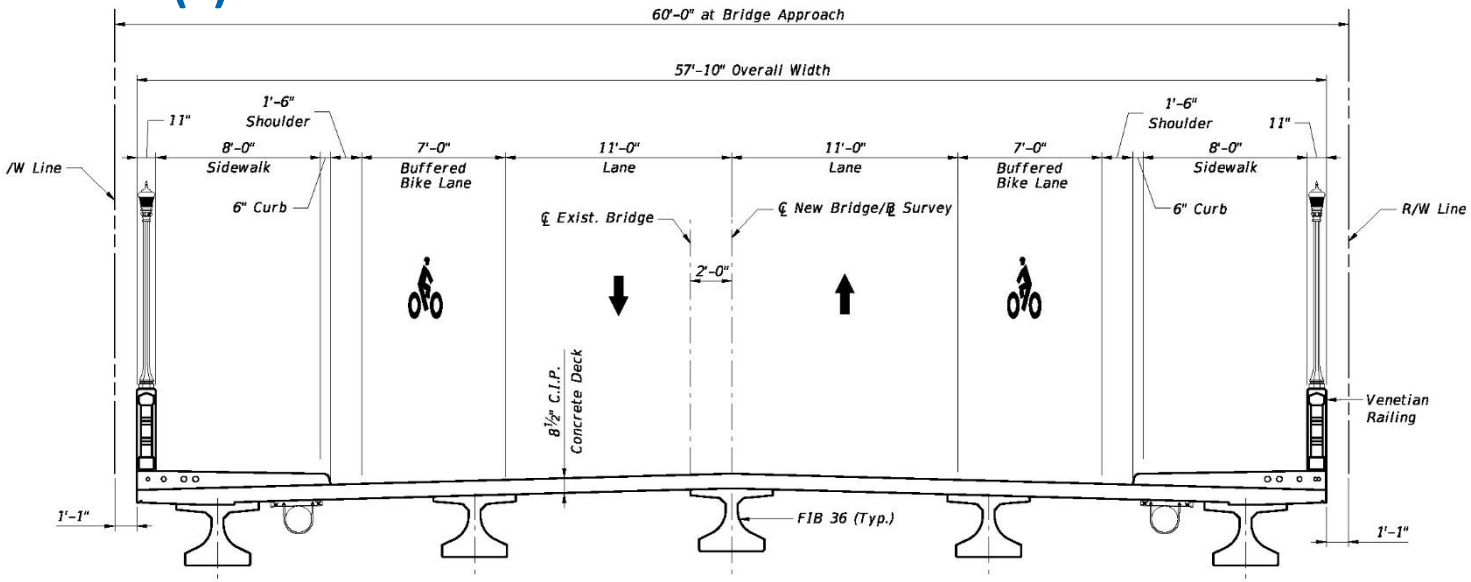


Elevation View

Replacement Alternatives – Fixed Bridges

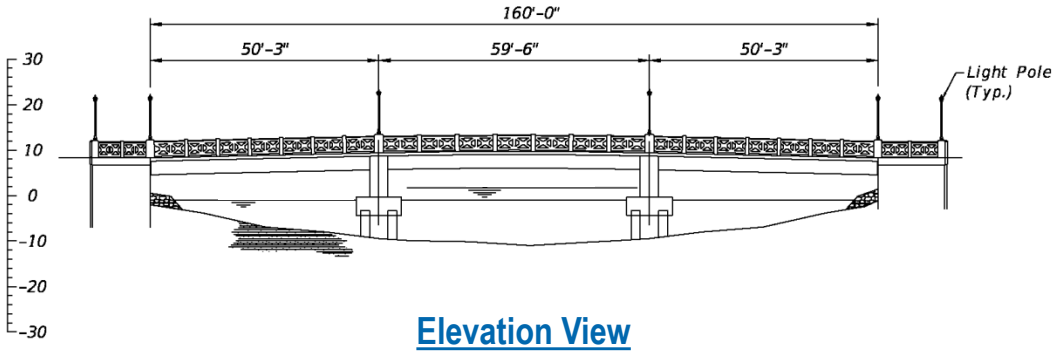
Alt. 9

Alt. 9 – FIB (F)



Typical Section

- **Estimated Cost Range:**
  $35 - $39 Million
  High Range for Phased Construction

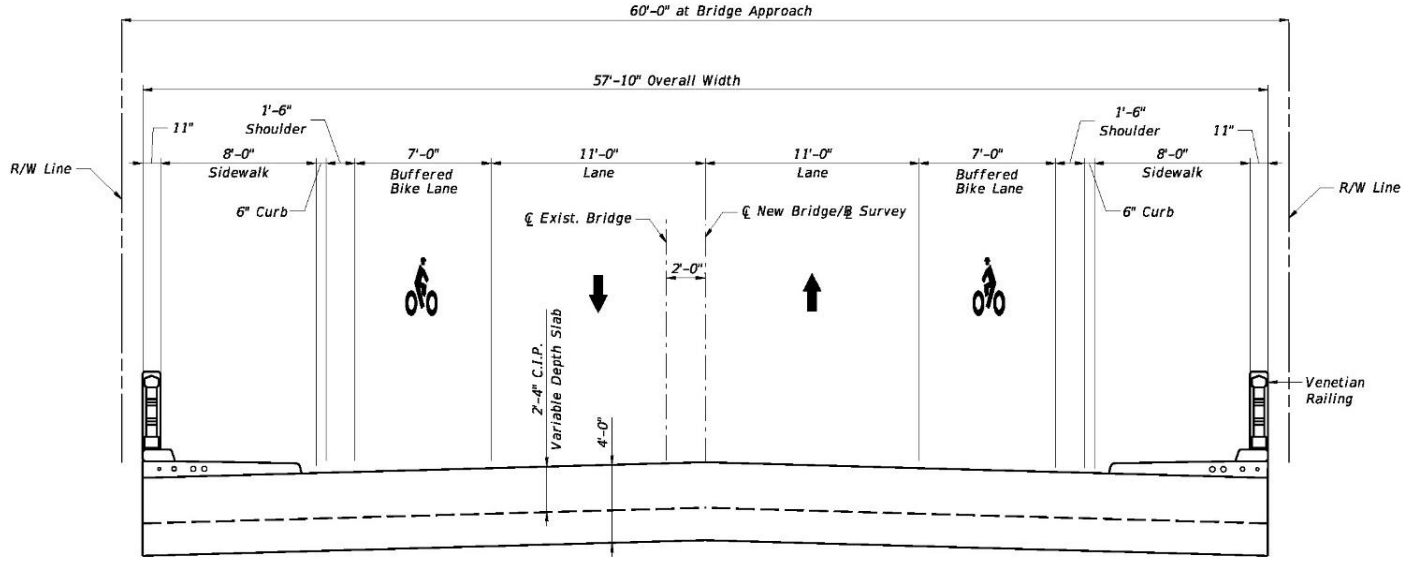


Elevation View

Replacement Alternatives – Fixed Bridges

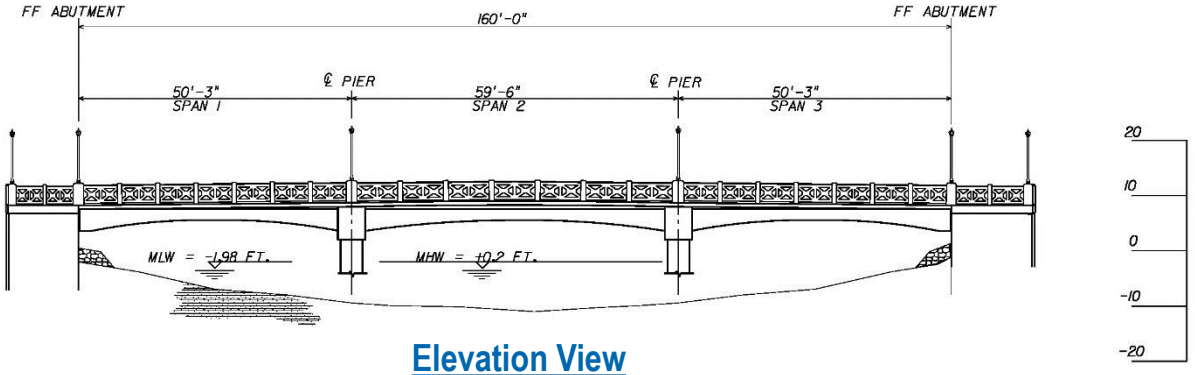
Alt. 10

Alt. 10 – Cast-in-Place Slab (Flat/Variable Depth)



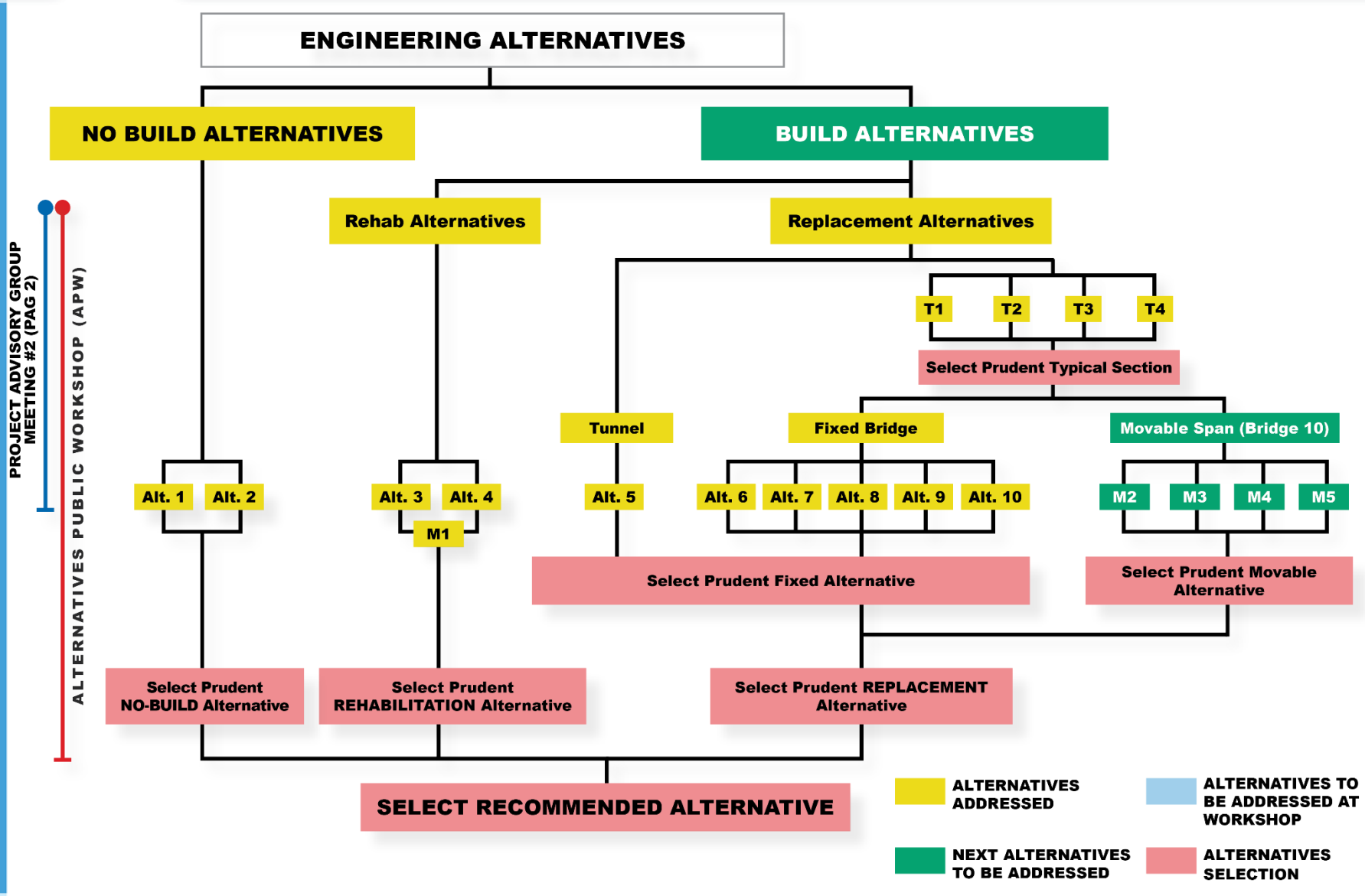
Typical Section

- **Estimated Cost Range:**
  $47 - $52 Million*
  High Range for Phased Construction



Elevation View

Summary and Next Steps



Replacement Alternatives – Movable Bridges

M2

Alt. M2 – Swing Bridge/ Movable Span alternative

Advantages:

- Low Construction Cost
- Unlimited Vertical Clearance in Open Position
- Provides two Channels

Disadvantages:

- Hazard to Navigation
  - Pivots toward Approaching Vessels
  - Swing Span More Exposed to Vessel Collision
- No Direct Access to Swing Span in Open Position
- Non-Redundant for Maintenance

Estimated Cost Range: $28 - $30 Million

Replacement Alternatives – Movable Bridges

M3

Alt. M3 – Vertical Lift Bridge

Advantages:

- **Shallower Girders/More Vertical Clearance - Span Lowered**
- **Typically Spans Longer Distance**
  - Span Waterway with no Piers in Water
  - Greater Horizontal Clearance
  - Improved Navigation Safety

Disadvantages:

- **High Construction Cost**
- **Tall Towers (85 to 90 ft)**
- **Restricted Vertical Clearance with Span Raised (65 ft)**
- **Longer Operating Time**
- **Non-Redundant for Maintenance**

Estimated Cost Range: $32 - $35 Million

M4

Replacement Alternative – Movable Bridges

Alt. M4 – Movable Span Alternatives M4 – Double Leaf & M5 – Single Leaf Bascules

Advantages:

- Economical/Low Construction Cost
- Unlimited Vertical Clearance in Raised Position
- Shortest Operating Time
- Most Similar to Existing Bridge
- Good Maintenance Access

Disadvantages:

- Larger Pier(s) in Waterway

M4 - Double Leaf Bascule:

- Redundant for Maintenance
- Shallower Girders/More Clearance
- Two Smaller Piers
- Symmetric Arrangement

M5 -Single Leaf Bascule:

- Non-Redundant for Maintenance
- Deeper Girders/Less Clearance
- One Larger Pier/One Smaller Pier
- Asymmetric Arrangement

M4

Replacement Alternative – Movable Bridges

Alt. M4 – Double Leaf Bascule Bridge

M4

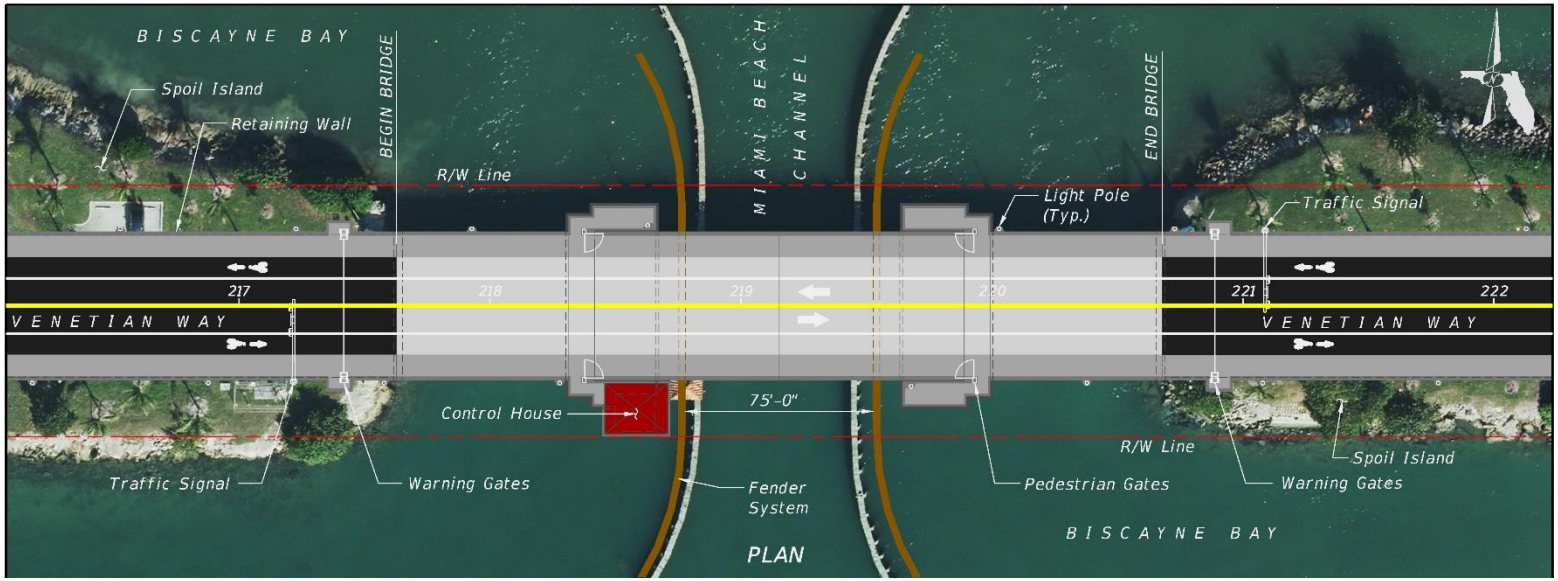
Replacement Alternative – Movable Bridges

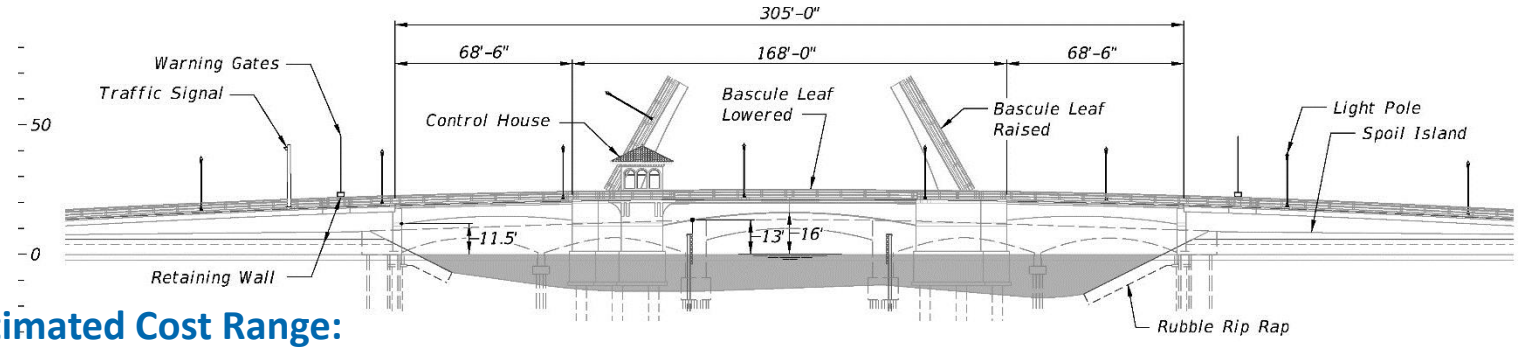
Alt. M4 – Double Leaf Bascule Bridge

M4

Replacement Alternative – Movable Bridges

Alt. M4 – Double Leaf Bascule Bridge





Elevation

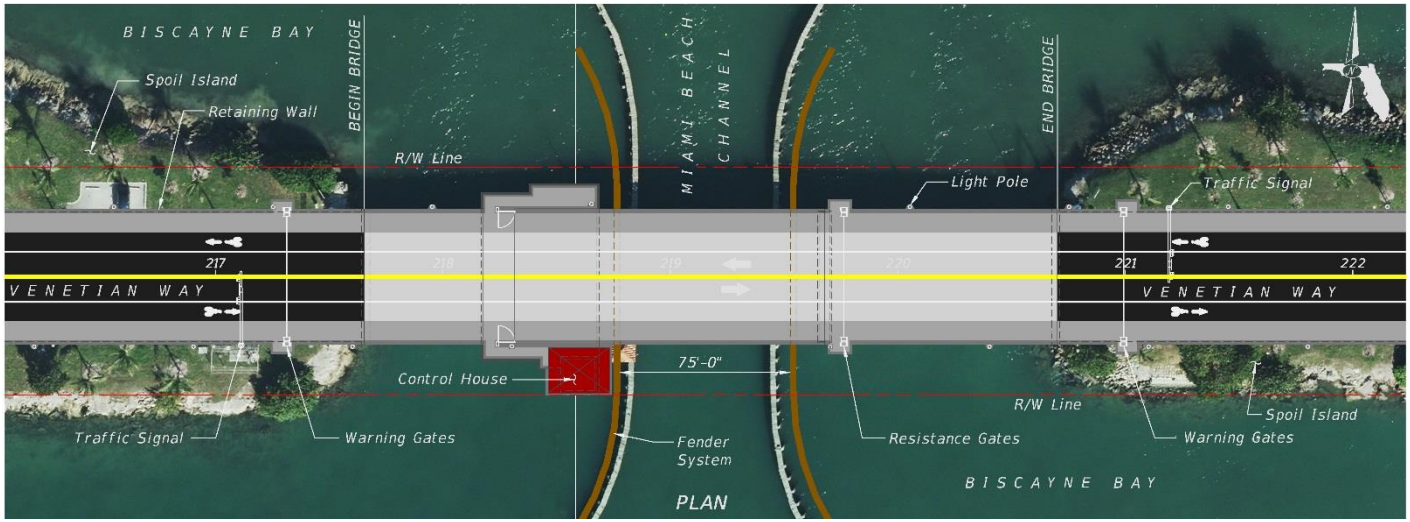
Estimated Cost Range:

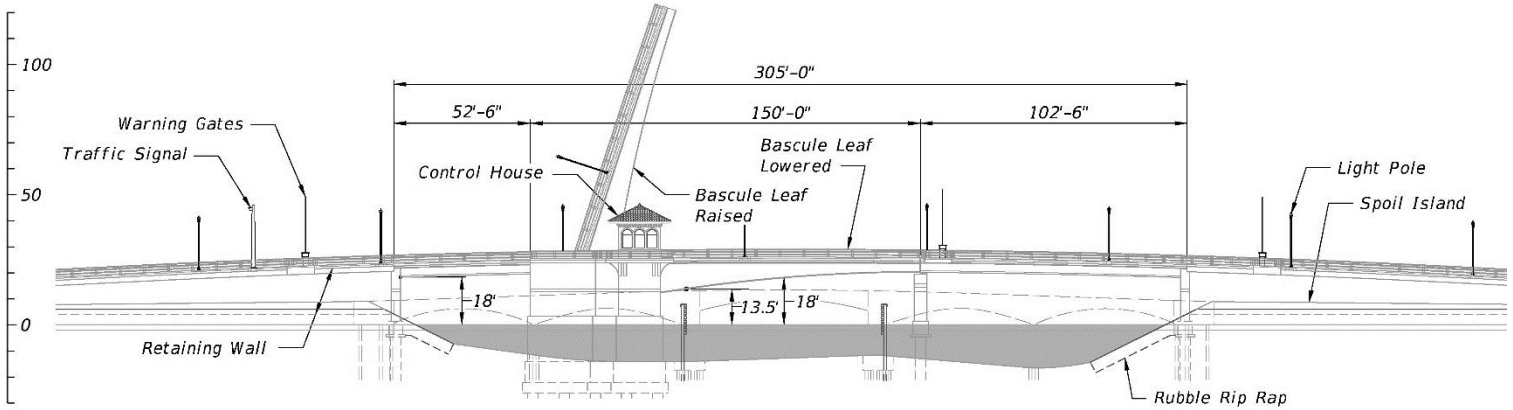
$29- $33 Million

M5

Replacement Alternative – Movable Bridges

Alt. M5 – Single Leaf Bascule





Elevation

Estimated Cost Range: $27- $30 Million

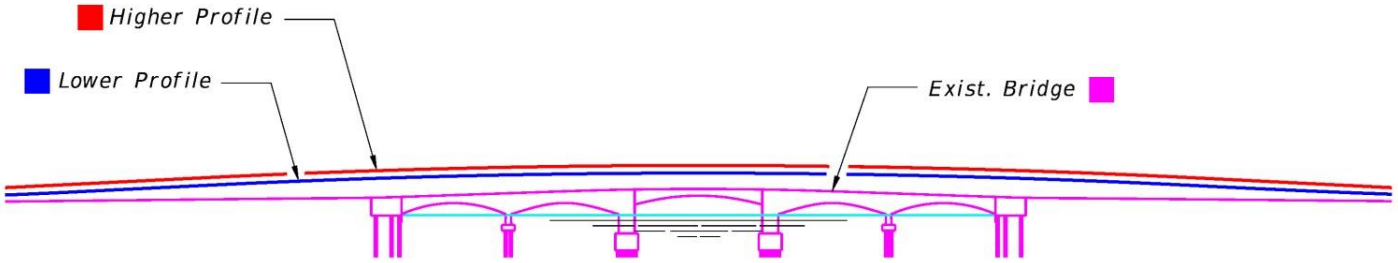
Replacement Alternative – Movable Bridges

Bridge Clearances (Replacement – East Bascule Bridge 10)

i. Navigational
   - Horizontal – increase for safety
   - Vertical – higher profile (Vessel study Diagram – Impacts of different heights)

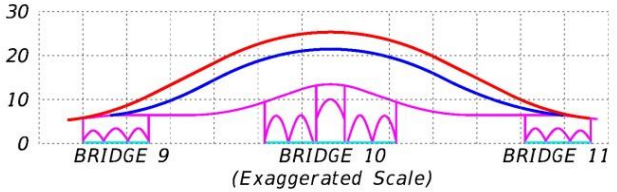
ii. Benefits of higher vertical profile

- **Lower Profile**:
  - Raises Peak Approx. 8 ft
  - 30% more Vessels can pass without an Opening
  - Lowest Recommended Height for Flooding during Coastal Storms
  - Requires Bridge 9 and 11 Modifications
- **Higher Profile**:
  - Raises Peak Approx. 12 ft
  - 50% more Vessels can pass without an Opening
  - Exceeds Recommended Height for Corrosion Protection and Flooding during Coastal Storms
  - Requires Bridge 9 and 11 Replacement



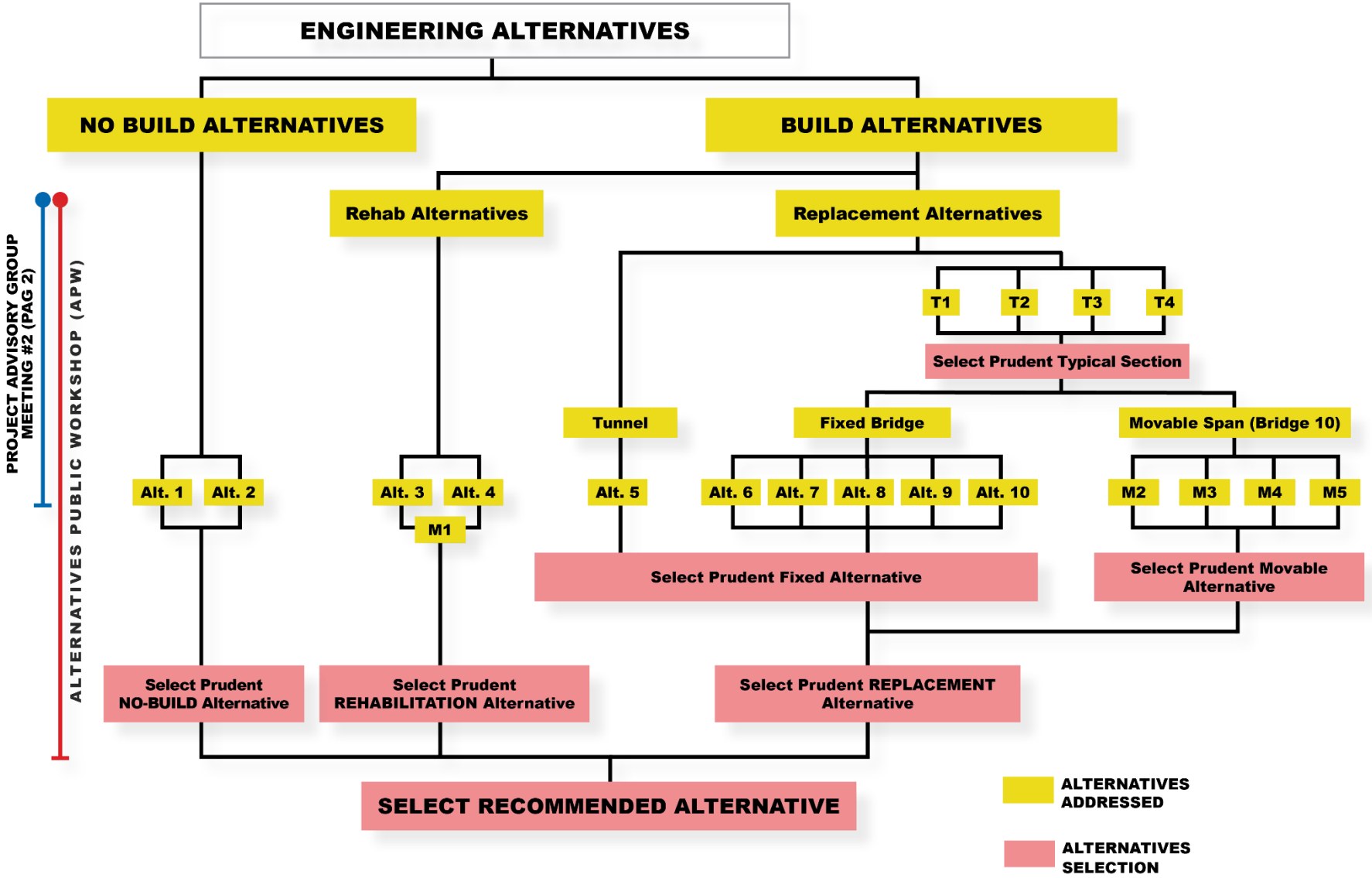
BRIDGE 10 (True Scale)

NAVIGATION CLEARANCE POINT	VERT. CLEAR. (ABOVE MEAN HIGH WATER)		
	EXISTING	HIGHER	LOWER
at Fender	6.0'	17.0'	13.0'
at Center	10.0'	20.0'	16.0'
DECK ELEVATION AT PEAK	13.45'	25.32'	21.45'



BRIDGE 10 - VERTICAL PROFILE ALTERNATIVES

Summary and Next Steps



Life Cycle Costs

- Sections 1024 and 1025 of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) specified that consideration should be given to life-cycle costs in the design and engineering of bridges, tunnels, and pavements.

- **Guidance for Life Cycle Cost Analysis (LCCA)**
  - National Cooperative Highway Research Program (NCHRP) Report 483 – Bridge Life-Cycle Cost Analysis

- **Elements to be considered include:**
  - Project Costs (Construction, Design etc.)
  - Service Life
  - Maintenance Costs
  - Maintenance Cycle

Other Considerations

Environmental Impacts of No-Build vs Build

- **No Build Alternatives result in no environmental impacts**
- **Build Alternatives (Rehab. or Replacement)**
  - Similar natural resource impacts for both rehabilitation and replacement.
  - Potential impact to corals on substructure & scour protection areas
  - Temporary impacts due to construction methods
    - Barge Use, water quality, noise, air quality
  - Minimal threatened & endangered species involvement
    - Informal Section 7 (of the Endangered Species Act) Consultation with USFWS & NMFS
  - Retain and improve bicycle and pedestrian access

Historic Resource Impacts of No-Build vs. Build

- **No Build Alternatives result in No Adverse Effects/Impacts to the historic resources**

- **Build Alternatives**
  - Rehabilitation - May Likely Result in Adverse Effects/Impacts to the historic resources
  - Replacement - Adverse Effects/Impacts to the historic Resources

- **Adverse Effects**
  - Section 106 Effects Determination Case Study Report, Memorandum of Agreement, and further consultation with affected parties will be necessary.
  - Section 4(f) documentation also required.

Other Considerations

Maintenance of Traffic (MOT) – Individual Bridge Detours

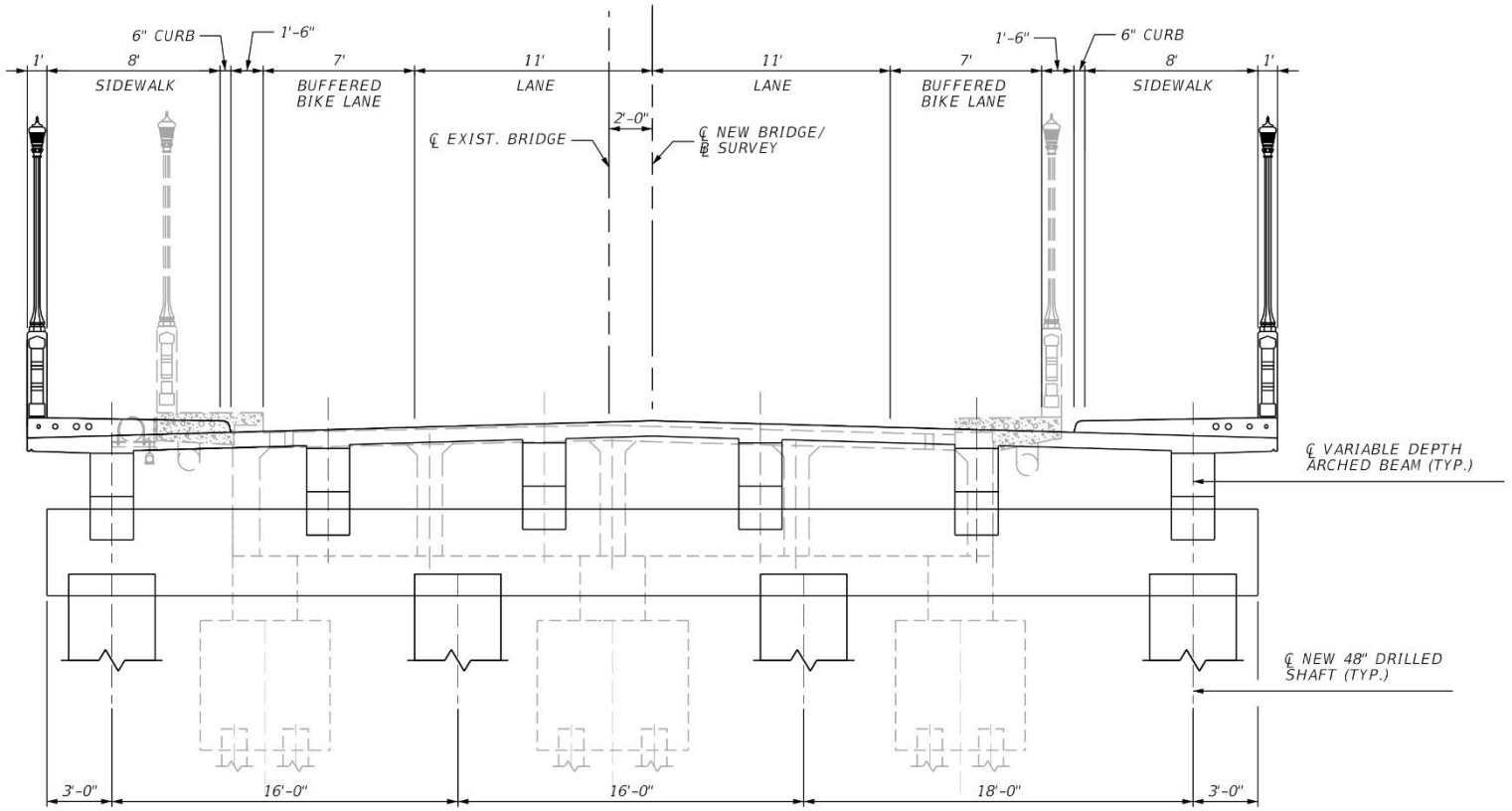
- Same considerations for Rehabilitation or Replacement as both remove the deck
- Detours affect one bridge location at a time
- Construction Duration
- Public Safety
- Emergency Services
- Maintain Utility Services

Other Considerations

Maintenance of Traffic – Temporary Fixed Bridge (at Bridge 10 only)

- **Used during 1998 rehabilitation**

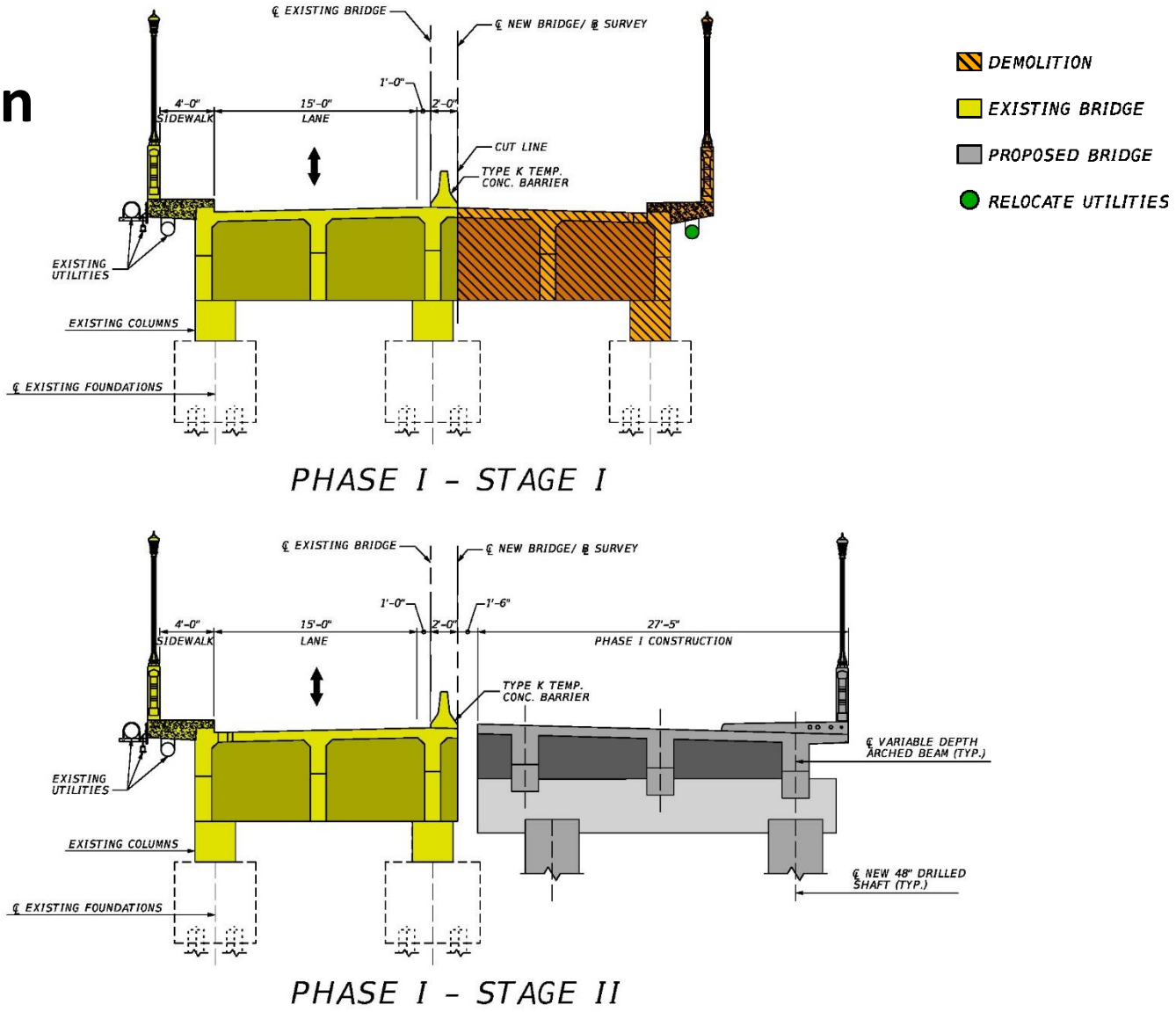
Maintenance of Traffic (MOT)



Wider typical section creates an opportunity to Phase Construct the fixed bridges while maintaining one lane of 2-way traffic and shared use path for pedestrians/cyclists.

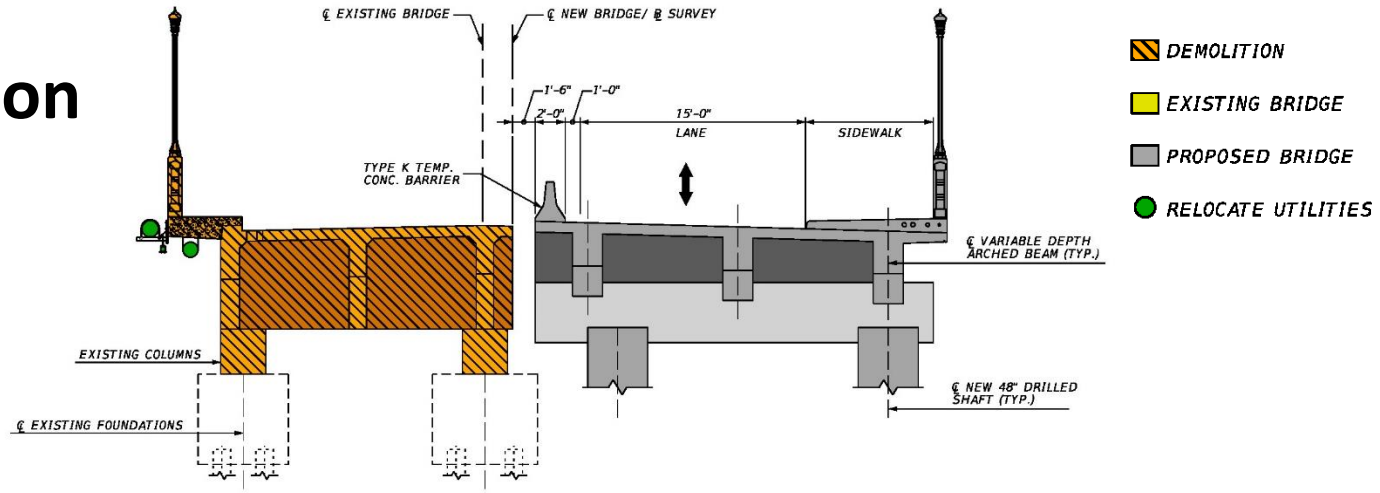
Other Considerations - MOT

Phased Construction

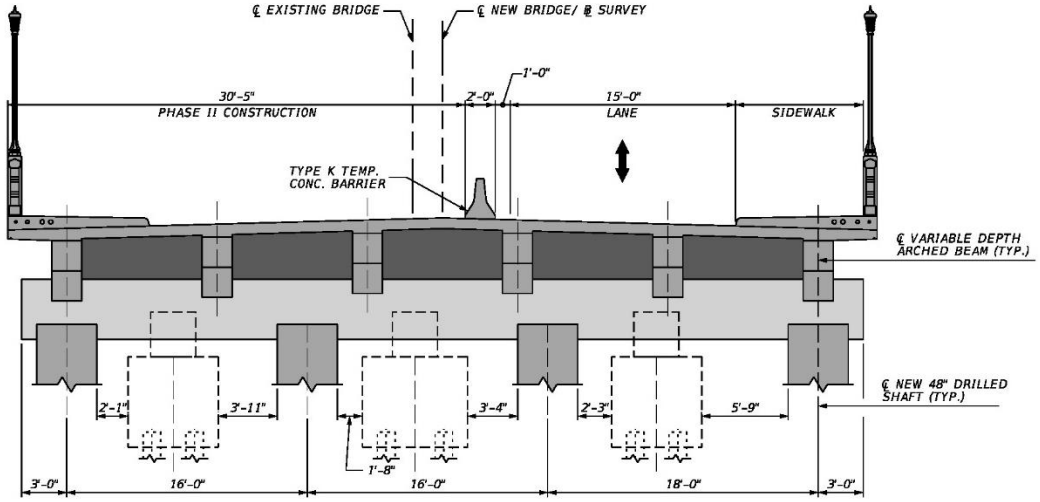


Other Considerations - MOT

Phased Construction

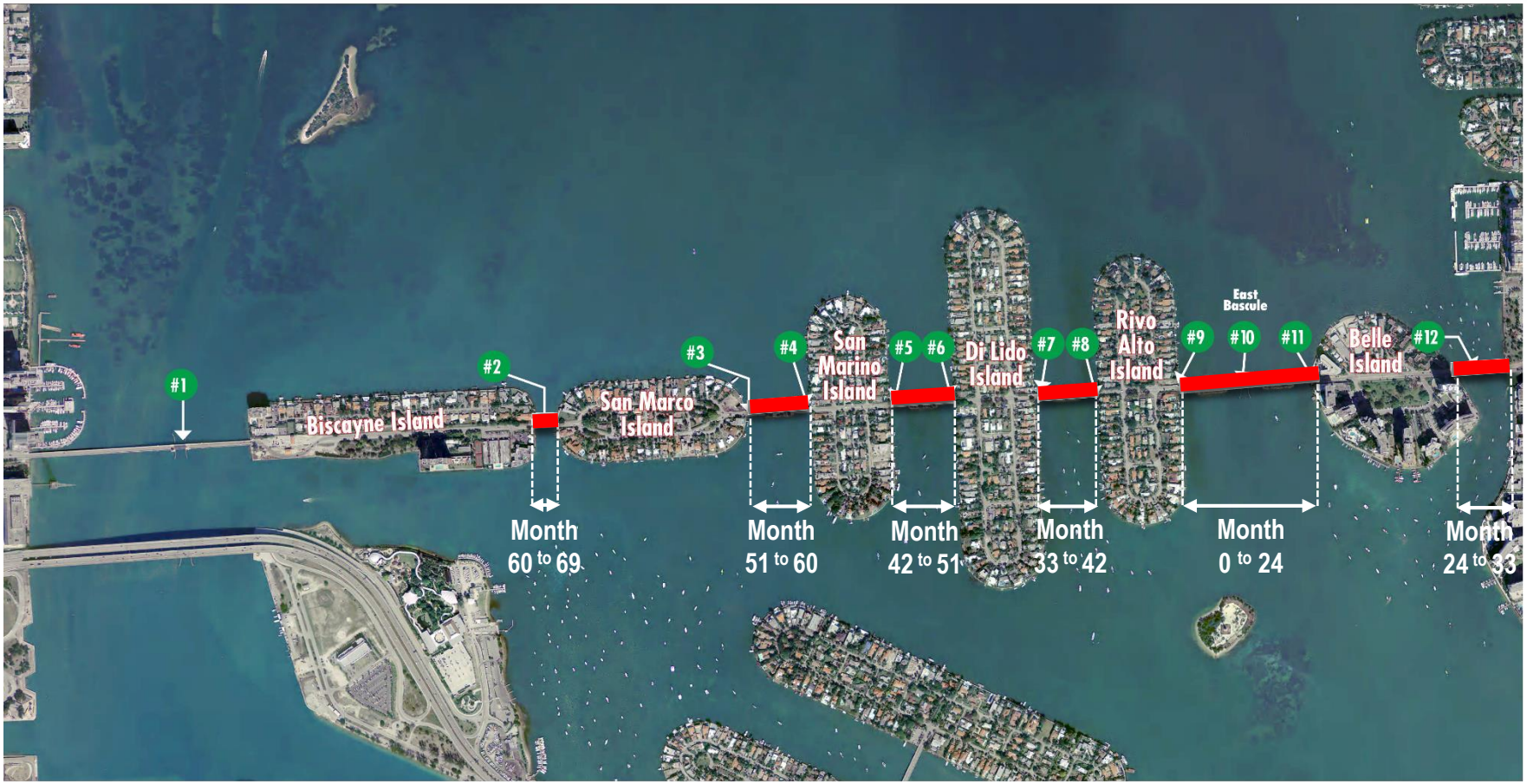


PHASE II – STAGE I



PHASE II – STAGE II

Other Considerations - MOT Option 1



Maintenance of Traffic Plan – Close one bridge at a time and detour traffic

OPTION 1	REHABILITATION	REPLACEMENT
	67 MONTHS without Beam Strengthening *82 MONTHS with Beam Strengthening*	*69 MONTHS*

Detour

Bridge Numbers

Other Considerations - MOT Option 2

Maintenance of Traffic Plan – Detour Traffic at East Bascule, 1 Lane 2-Way Traffic, Limit Access Impacts to One Island at a Time

OPTION 2

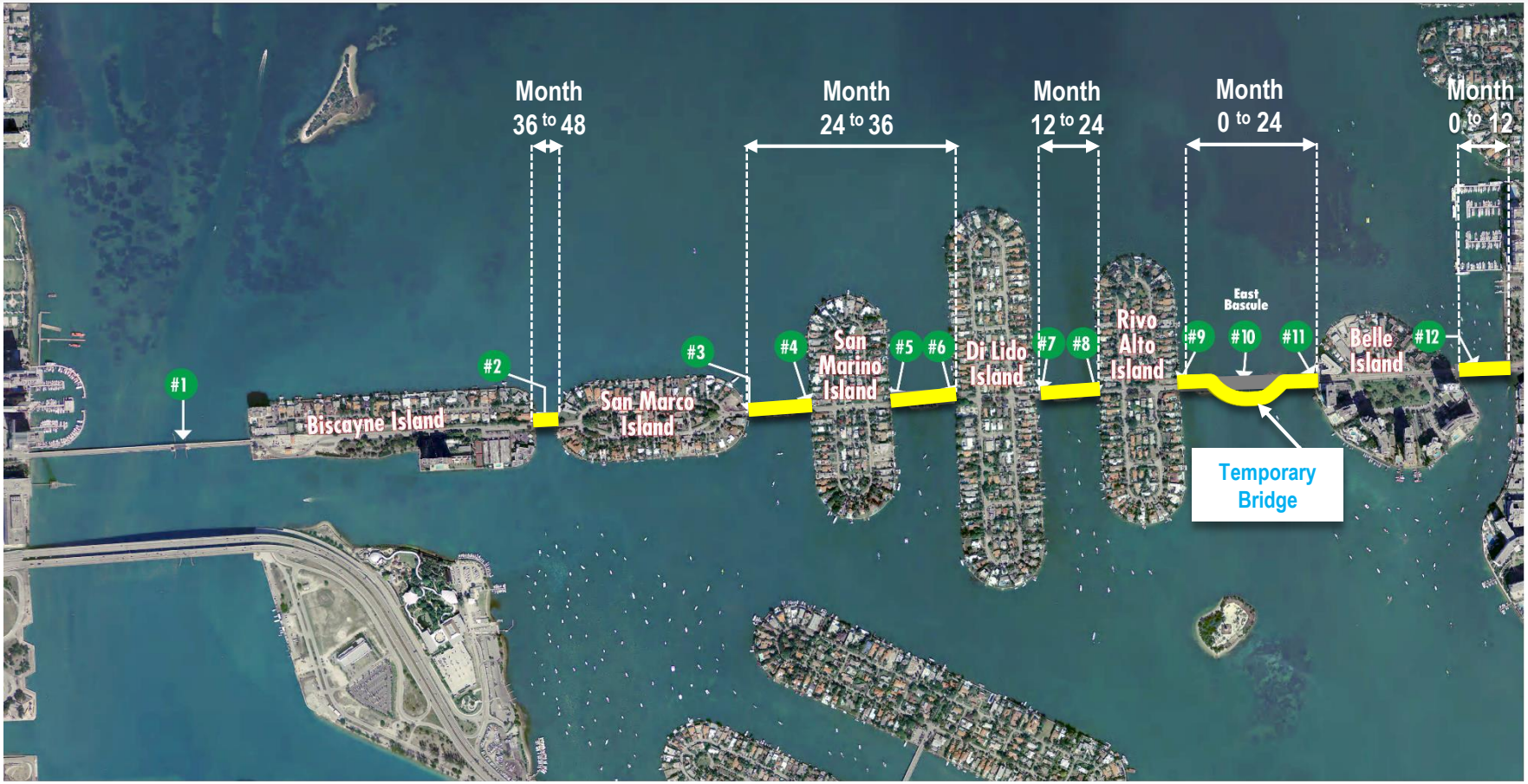
Replacement Phased Construction

48 MONTHS

(with 24 month detour at Bridge #10)

- Detour
- 1-Lane/2-Way
- ## Bridge Numbers

Other Considerations - MOT Option 3



Maintenance of Traffic Plan – Temporary Bridge at East Bascule with 1 Lane 2-Way (Pedestrians & Bicycle Access). Limit Access Impacts to One Island at a Time

OPTION 3

Replacement Phased Construction with Temporary Bridge
48 MONTHS

1-Lane/2-Way

Bridge Numbers

Other Considerations

Utility Services

- **Maintain services throughout Construction**
  - Approach is dependent on selected MOT concept
- **Different Approach for Rehabilitation and Replacement**
  - Rehabilitation leaves portion of bridge from which utilities are supported
  - Replacement using phased construction may allow for accommodation of utilities from bridges
- **Subaqueous Crossings may be required**

Evaluation Matrix

Criteria	No Build Alternatives				Build Alternatives										Value Engineering Alternative	
					Rehabilitation						Replacement Alternative					
	Alt 1 - No Build		Alt 2 - TSM		Alt 3 - Rehabilitation without Beam Strenghtening		Alt 4 - Rehabilitation with Beam Strenghtening		Alt M1 - Bascule Bridge Rehabilitation		Alt #		Alt M#		VE Alternative	
Meet Current Safety Standards																
National Register of Historic Places Listing																
Environmental Impacts																
Natural																
Physical																
Cultural																
Social and Economic Impacts																
Service Life																
Typical Sectional Funcitionality																
Structural Capacity																
Hurricane Resistance																
Vessel Collision Resistance																
Bridge Railings																
Bridge Clearances																
Maintenance of Traffic During Construction																
Utility Services																
Pedestrian and Bicycle Facilities																
Safety																
Operations																
Meets Purpose and Need																
Fixed Bridge Costs																
Movable Bridge Costs																
Subtotal Estimated Bridge Construction Cost (including fender system)																
Roadway Construction Costs																
Contingency																
Engineering Costs																
CEI Cost																
Total Cost Estimate																
Maintenance Costs																
Life Cylcle Costs																
Total Points		0		0		0		0		0		0		0		0

Alternatives Matrix / Ranking Ballot

Name: Joe Sample
Address: 1234 Venetian Way, Miami, FL, 33139
Phone No.: (305) 765-4321
Email Address: jsample@email.com

Ranking Ballot

APW # 1

1. Select either No-Build, Rehabilitation or Replacement in the Option column by circling the option. **Select one option only.**
2. Rank the alternatives within the option you selected. Assign a "1" to the top ranked alternative for the selected option, "2" your second ranked alternative, etc.
3. Rank the Maintenance of Traffic Options, with "1" being the most preferred.
4. Please hand in the Ranking Ballot at the Alternatives Public Workshop, e-mail to Dat.Huynh@dot.state.fl.us by 5/20/2015 or mail (post marked by 5/20/2015) to: Dat Huynh, P.E., Florida Department of Transportation – District 6; Adam Leigh Cann Building 1000 NW 111 Avenue, Room 6251 Miami, Florida 33172

Option	Alternative	Description	Ranking
No-Build Alternative	1	Do Nothing	1
	2	Transportation System Management	2
Rehabilitation Alternatives			
Build Alternatives *Rehabilitation*	3	Fixed Bridge Rehab w/out Beam Strengthening	
	4	Fixed Bridge Rehab with Beam Strengthening	
	M1	Bascule Bridge Rehabilitation	
Replacement Alternatives			
Build Alternatives *Replacement*	**Typical Section Alternatives**		
	T1	Venetian Railing	
	T2	Wyoming Railing TL-4 at coping	
	T3	Wyoming Railing TL-3 at curb and Original Venetian Railing at Coping	
	T4	Wyoming Railing TL-3 at curb and Custom Railing at Coping	
	Fixed Alternatives		
	5	Tunnel	
	6	High Level Fixed Bridge	
	7	Arched Beams	
	8	FIB With Arched Fascia	
	9	FIB	
	10	Cast-in-Place Slab (Flat/Variable Depth)	
	Movable Bridge Alternatives		
	M2	Swing Bridge	
	M3	Vertical Lift Bridge	
	M4	Double Leaf Bascule Bridge	
	M5	Single Leaf Bascule Bridge	
Maintenance of Traffic			
	Option 1	Detours	
	Option 2	Phased Construction With Detour at East Bridge	
	Option 3	Phased Construction With Temporary Bridge at East Bascule	

Alternatives Matrix / Ranking Ballot

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Phone No.: (305) 765-4321
Email Address: jsample@email.com

Ranking Ballot

APW # 2

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Option	Alternative	Description	Ranking
No-Build Alternative	1	Do Nothing	
	2	Transportation System Management	
Rehabilitation Alternatives			
Build Alternatives *Rehabilitation*	3	Fixed Bridge Rehab w/out Beam Strengthening	1
	4	Fixed Bridge Rehab with Beam Strengthening	2
	M1	Bascule Bridge Rehabilitation	
Replacement Alternatives			
Build Alternatives *Replacement*	**Typical Section Alternatives**		
	T1	Venetian Railing	
	T2	Wyoming Railing TL-4 at coping	
	T3	Wyoming Railing TL-3 at curb and Original Venetian Railing at Coping	
	T4	Wyoming Railing TL-3 at curb and Custom Railing at Coping	
	Fixed Alternatives		
	5	Tunnel	
	6	High Level Fixed Bridge	
	7	Arched Beams	
	8	FIB With Arched Fascia	
	9	FIB	
	10	Cast-in-Place Slab (Flat/Variable Depth)	
	Movable Bridge Alternatives		
	M2	Swing Bridge	
	M3	Vertical Lift Bridge	
	M4	Double Leaf Bascule Bridge	
	M5	Single Leaf Bascule Bridge	
Maintenance of Traffic			
	Option 1	Detours	1
	Option 2	Phased Construction With Detour at East Bridge	
	Option 3	Phased Construction With Temporary Bridge at East Bascule	

Alternatives Matrix / Ranking Ballot

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Ranking Ballot

APW # 3

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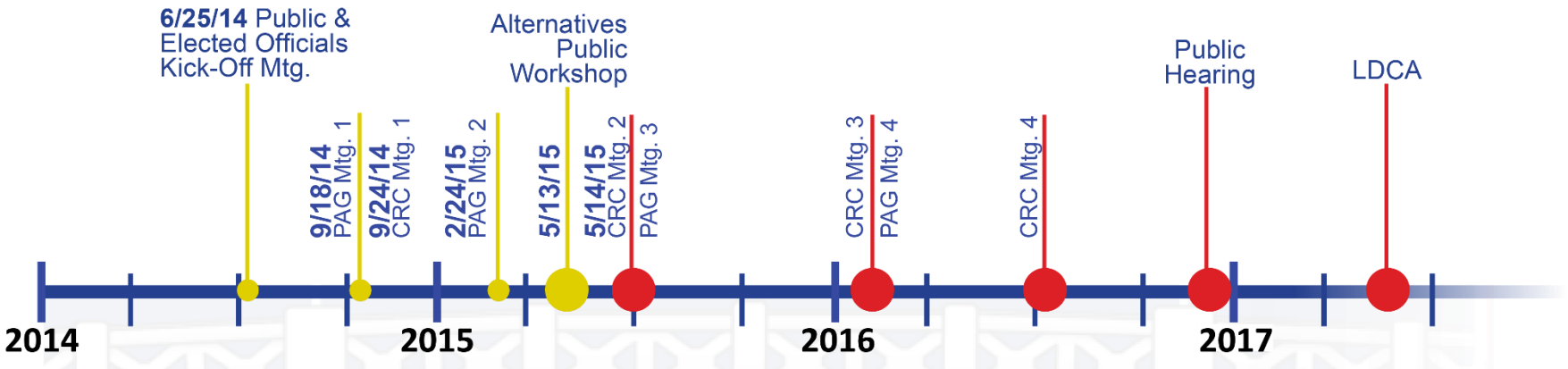
Rehabilitation Alternatives			
Build Alternatives *Rehabilitation*	3	Fixed Bridge Rehab w/out Beam Strengthening	
	4	Fixed Bridge Rehab with Beam Strengthening	
	M1	Bascule Bridge Rehabilitation	
Replacement Alternatives			
Build Alternatives *Replacement*	**Typical Section Alternatives**		
	T1	Venetian Railing	1
	T2	Wyoming Railing TL-4 at coping	2
	T3	Wyoming Railing TL-3 at curb and Original Venetian Railing at Coping	3
	T4	Wyoming Railing TL-3 at curb and Custom Railing at Coping	4
	Fixed Alternatives		
	5	Tunnel	1
	6	High Level Fixed Bridge	2
	7	Arched Beams	3
	8	FIB With Arched Fascia	4
	9	FIB	5
	10	Cast-in-Place Slab (Flat/Variable Depth)	6
	Movable Bridge Alternatives		
	M2	Swing Bridge	1
	M3	Vertical Lift Bridge	2
	M4	Double Leaf Bascule Bridge	3
	M5	Single Leaf Bascule Bridge	4
Maintenance of Traffic			
	Option 1	Detours	1
	Option 2	Phased Construction With Detour at East Bridge	2
	Option 3	Phased Construction With Temporary Bridge at East Bascule	3

Summary: Anticipated Project Schedule

Next Steps

CRC 2, PAG 3, CRC 3



LEGEND

CRC: Cultural Resource Committee
MTG: Meeting
PAG: Project Advisory Group
LDCA: Location Design Concept Acceptance

Drive Safely

Stay Informed

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ONLINE

- Project webpage - Updates posted weekly

  http://www.fdotmiamidade.com/venetianbridgestudy

- Efficient Transportation Decision Making (ETDM)

  https://etdmpub.fla-etat.org/est/

  - **Click on Project Number on left hand menu**
  - **Type in 12756**
  - **Click "Go" or press Enter**